ENGINEERING NEWS-RECORD

DECEMBER 4, 1941

Double-drum paver, special remix hopper and concrete pump in use on lining of Delaware Aqueduct

Cement Dispersion Principles
Navy's Barrel-Shell-Roof Hangar
Pre-cut Lumber Speeds Housing
New Test for Earth Fill Density

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ANN ARBOR MICH

Another interesting sewage outfall construction job was recently completed when the Boro of Deal, New Jersey, installed an 1100 foot line of 17½" O.D. Byers Wrought Iron Pipe. The outer end of the first section was plugged. Successive sections were butt-welded on, and the joints reinforced with welded sleeves.

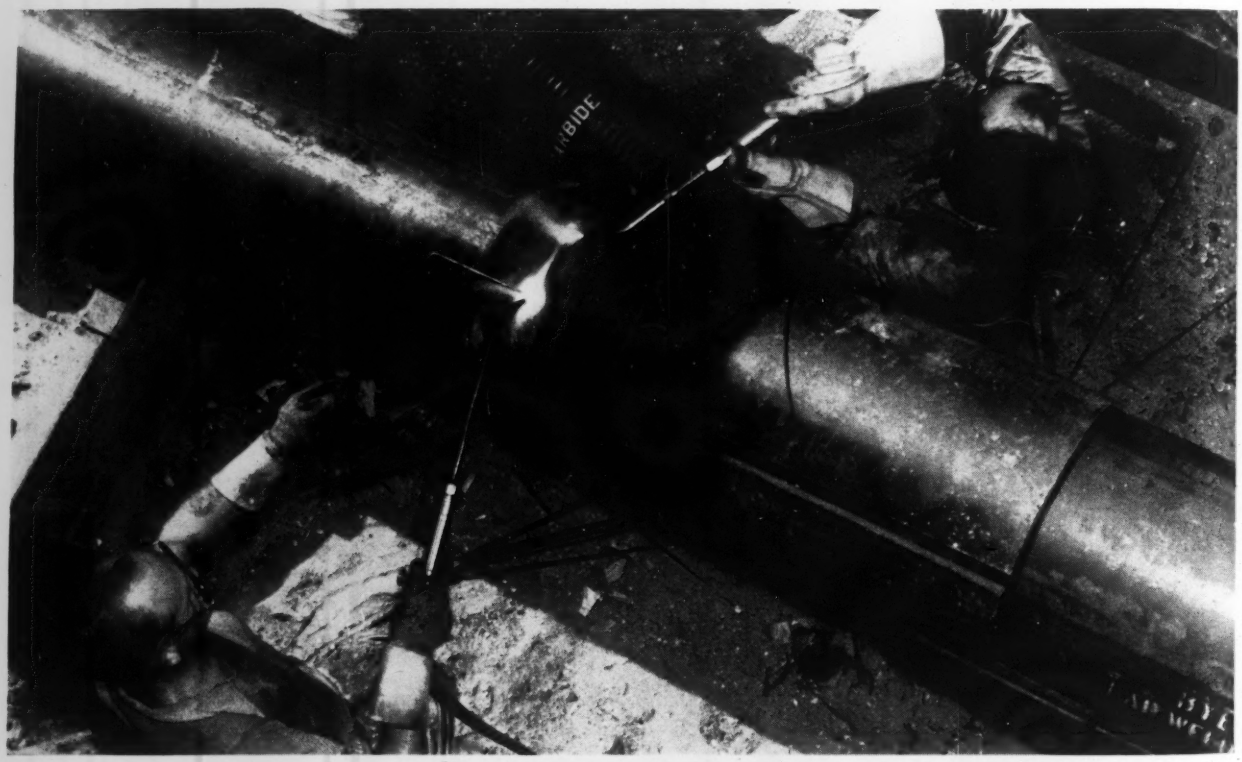
The outer end of the pipe, supported by two boats lashed together, was kedged seaward, with the assistance of a donkey engine ashore. A smaller pipe was placed within the larger to act as a weight. When necessary, water was pumped into the small pipe to sink the outfall. Claude Birdsall was the Civil Engineer on this project.

There is plenty of sound engineering precedent for the use of Wrought Iron on this job. The Boro of Deal is the seventh New Jersey community to use Byers Wrought Iron for outfall lines during the past few years. Several installations have been made on the Pacific Coast—including one at the Presidio, San Fra sco, where 50-year-old wrough iron dock supports salvaged fr the Fort Mason Dock were re-u for an outfall line.

BYERS WROUGHT IRON PROTECTS THIS SEA-GOING SEWER LINE

If you have any new constr tion or repair work involving outf s or other lines where similar s vere conditions are present, it wil pay you to find out what wrought iron can do. Our Engineering Service Department can give you authentic performance data. Ask, also, for our bulletin "Wrought Iron in Salt Water Services."

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.



Corrosion costs you more than Wrought Iron

BYERS GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
STEEL TUBULAR PRODUCTS

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewers, Waterworks, Bridges, Highways, Streets, Dams, Foundations, Earthwork, Flood Control, Public Works, Irrigation, Canals, Railroads

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Vol 127 DECEMBER 4, 1941 No. 23

THIS WEEK

• Lining methods on the 85 miles of tunnel on the Delaware Aqueduct differed with each contractor, and the various procedures are reviewed in detail. Equipment represented almost every modern development in handling and placing tunnel concrete.

• Cement dispersion is discussed in an authoritative article which reviews the advantages to be obtained in having the particles of cement completely separated in the mix to aid the process of hydration and the quality of the resulting product.

• A combination of pre-cutting and site assembly produced an effective procedure on the 600-unit defense housing project at Linden, N. J. The contractor's methods, which are described, resulted in a progress rate of two completed houses per day.

• Thin-shell barrel-type concrete arch hangars for the Navy at San Diego are described as a notable contribution of the national defense program to the field of building construction.

THINGS TO COME

• National defense has stimulated an emergency expansion in the water storage and power production facilities of the TVA. This program, its relation to existing works and current progress are to be reviewed by T. B. Parker, chief engineer of the Authority.

• Closed by a dike, the dredged area for a Navy graving dock at Long Beach, Calif., was successfully unwatered and concreted in the dry to establish a new procedure for this type of structure. An article will describe the unwatering and concrete placing.

PAGE

The Week's Events 53

Reader Comment 60

Editorials 62

Navy Builds Concrete Hangars at San Diego 64

Kanawha Boulevard at Charleston Extended WILLIAM BREWSTER 67

Lining the World's Longest Tunnel 70

Welding in Railway Maintenance 75

Pre-Cut Lumber Speeds Defense Housing 76

Sludge Gas for Motor Fuel 80

Cement Dispersion and Concrete Quality E. W. SCRIPTURE, JR. 82

Mobile Ozone Unit for Water Purification 85

Hydraulic Fill at Knightville Dam WILLIAM L. MASCHMEYER 86

Soil-Cement Blocks for Building Walls W. C. MC NOWN 90

Oil Used in Testing Earthfill Density STEPHEN POE 92

Sewers in Cold Climates 94

From Field and Office 95

Unit Prices 98

Men and Jobs 102

Material Prices 108

Meetings 118

New Aids to the Constructor 126

New Publications 133

Manufacturers' Activities 137

Construction Reports 141

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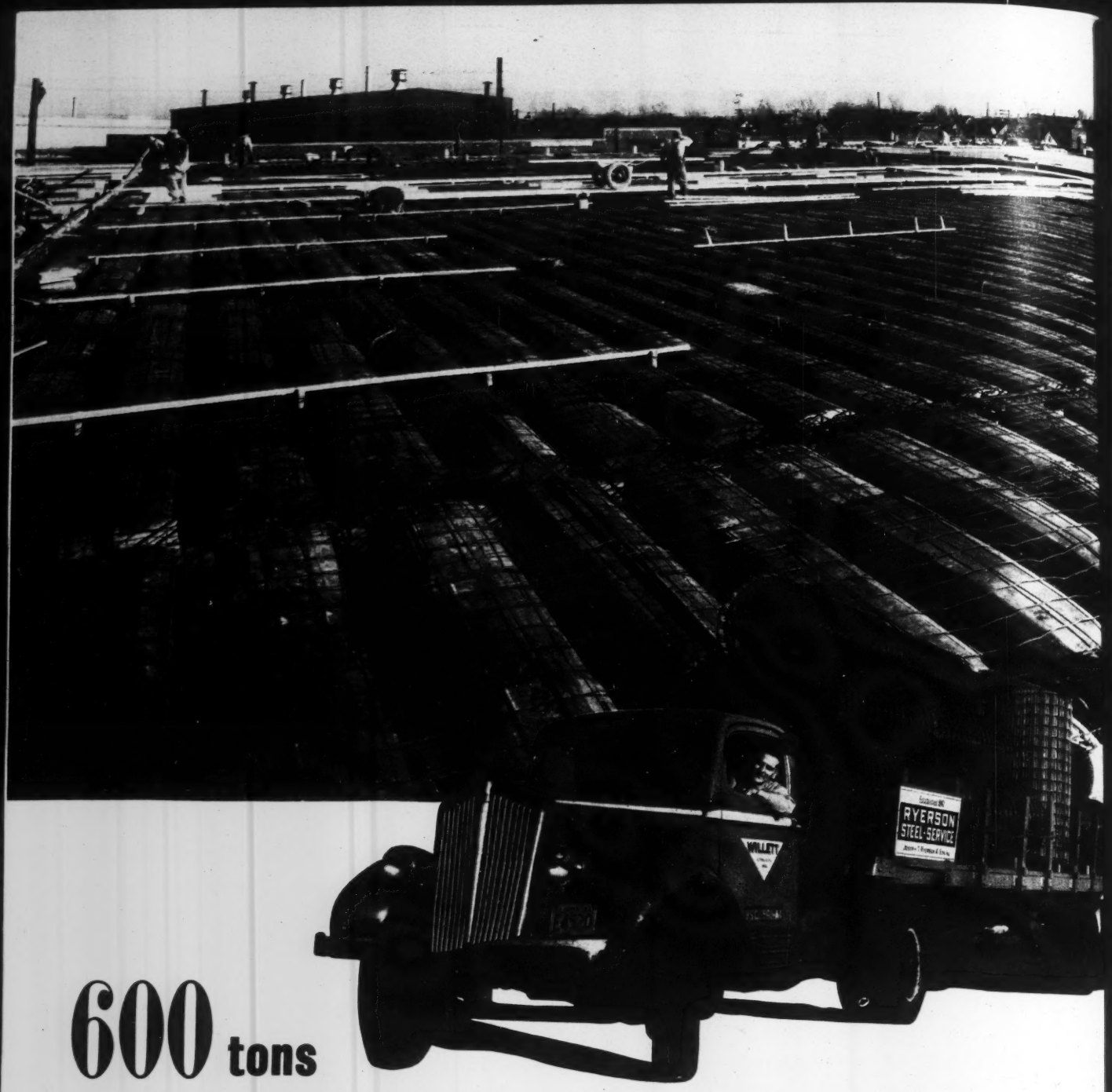


600 tons

of Ryerson Reinforcing used in this new Plant

Like thousands of other contractors, Dahl & Stedman—builders of this new Chicago plant—depend on Ryerson for prompt "on location" delivery of wire mesh, reinforcing steel and accessories.

It will also pay you to check with Ryerson whenever you need reinforcing bars, wire mesh, accessories, etc., for defense purposes. Bars are accurately cut, bent and tagged according to blue prints and specifications, and deliveries are always coordinated with the progress of the job.

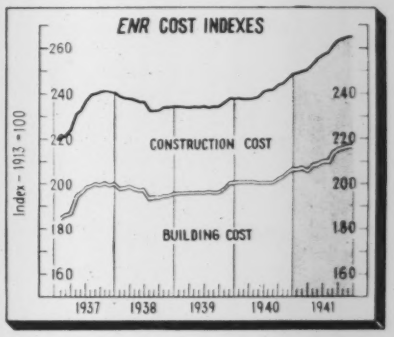
Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

MONTHLY CONSTRUCTION BUSINESS SUMMARY

ENR CONSTRUCTION VOLUME AND NEW CAPITAL . . . . FHA MORTGAGES

(,000 omitted)	November 1940	November 1941	% Change	Eleven Months 1940	Eleven Months 1941	% Change
Total Construction	$382,724	$348,800	−9.0	$3,588,539	$5,599,010	+56.0
Private Construction	101,590	68,432	−33.0	1,062,568	1,130,130	+6.0
Public Construction	281,134	280,368	−0.4	2,525,971	4,468,880	+77.0
Federal	184,396	221,391	+20.0	1,233,289	3,332,838	+170.0
Total New Productive Capital	$77,617	$193,091	+149.0	$3,610,990	$6,282,297	+74.0
Private Investment	39,146	45,340	+16.0	690,421	752,438	+9.0
Federal (non-federal work)	38,471	22,751	−41.0	638,608	578,741	−9.0
Federal (federal work)	.....	125,000	.....	2,281,961	4,951,118	+117.0
FHA Mortgages Selected for Appraisal	$83,829	$95,111*	+13.0	$1,194,441	$1,333,161*	+11.5

** Preliminary estimate.*



CONSTRUCTION COSTS . . . . WAGE RATES . . . PRICES

	December 1940	December 1941	% Change	Change November to December 1940 Nov.	1940 Dec.	1940 %	Change November to December 1941 Nov.	1941 Dec.	1941 %
E N R Construction Cost Index, 1913 = 100	249.12	266.16	+6.8	247.24	249.12	+0.8	266.13	266.16	‡
E N R Building Cost Index, 1913 = 100	208.19	216.37	+3.9	206.24	208.19	+0.9	216.54	216.37	−0.1
ENR 20-CITIES' AVERAGE									
Common Labor	$0.711	$0.769	+8.2	$0.711	$0.711	0	$0.768	$0.769	+0.1
Skilled Labor (Av. 3 trades)	1.481	1.521	+2.7	1.480	1.481	+0.1	1.521	1.521	0
Bricklayers	1.568	1.614	+2.9	1.568	1.568	0	1.614	1.614	0
Structural Ironworkers	1.542	1.588	+3.0	1.542	1.542	0	1.588	1.588	0
Carpenters	1.332	1.362	+2.3	1.330	1.332	+0.2	1.362	1.362	0
Cement, per bbl.	$2.53	$2.56	+1.2	$2.54	$2.53	−0.4	$2.54	$2.56	+0.8
Reinforcing steel, per cwt.	2.53	2.59	+2.4	2.53	2.53	0	2.60	2.59	−0.4
Struc. steel shapes, base	2.10	2.10	0	2.10	2.10	0	2.10	2.10	0
Sand, per ton	1.17	1.19	+1.7	1.17	1.17	0	1.19	1.19	0
Lumber, 2x4 Fir, per M ft.	39.80	46.70	+17.3	37.76	39.80	+5.4	46.86	46.70	−0.3
Lumber, 2x4 Pine, per M ft.	37.57	40.68	+8.3	36.15	37.57	+3.9	40.82	40.68	−0.3
Brick, common, per M	14.44	15.26	+5.7	14.44	14.44	0	15.16	15.26	+0.7
Ready-mixed concrete, c.y.	6.96	7.15	+2.7	6.94	6.96	+0.3	7.11	7.15	+0.6
Struct. clay tile, 3x12x12	74.79	77.24	+3.3	74.79	74.79	0	76.94	77.24	+0.4
Paving asphalt, cars, ton	14.21	15.10	+6.3	14.21	14.21	0	15.10	15.10	0

‡ *Less than .05 percent change.*

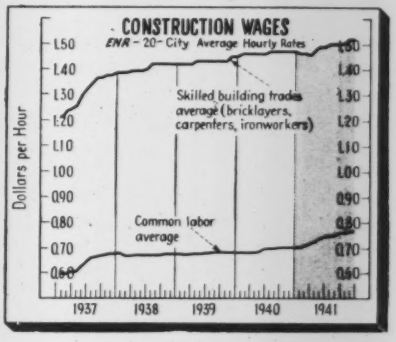
ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Dec., 1941	266.16	127.94	216.37	116.96	.....	.....
Nov., 1941	266.13	127.93	216.54	117.05	282	124
Oct., 1941	264.46	127.13	215.92	116.72	263	115
Sept., 1941	263.12	126.48	214.58	116.00	419	184
Aug., 1941	260.41	125.18	212.45	114.84	434	190
July, 1941	258.18	124.11	210.32	113.64	635	278
June, 1941	256.79	123.44	209.41	113.20	492	216
May, 1941	255.55	122.84	209.24	113.11	275	121
April, 1941	252.40	121.33	208.60	112.76	322	141
Mar., 1941	250.71	120.52	207.88	112.37	386	169
Feb., 1941	250.50	120.42	208.42	112.67	374	164
Jan., 1941	249.69	120.03	207.94	112.46	402	176
Dec., 1940	249.12	119.75	208.19	112.54	344	151
Nov., 1940	247.24	118.85	206.24	111.49	331	145
1941 (Av.)	257.84	123.95	211.46	114.32	.....	.....
1940 (Av.)	241.96	116.31	202.81	109.64	269	118
1939 (Av.)	235.51	113.21	197.44	106.73	211	92
1938 (Av.)	235.86	113.34	196.83	106.40	197	86

MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	November 1940	November 1941	% Change	Oct. 1941	% Change Oct.-Nov.
Lumber (% 1935-'39 wk. seas. av.) N.L.M.A.	137.8	130.8	−5.1	126.8	+3.2
Steel (% operating capacity) A.I.S.I.	96.3	96.9	+0.6	98.6	−1.7

	October 1940	October 1941	% Change	Ten Months 1940	Ten Months 1941	% Change
Fabricated structural steel, tons, A.I.S.C.	153,201	210,639	+37.7	1,213,025	1,885,271	+55.4
Cement, thous. bbl., U.S.B. of M	15,776	17,833	+13.0	111,751	142,273	+27.3
Building Permits, Dun & Bradstreet (,000 omitted)	$137,159	$124,735	−9.1	$1,146,575	$1,277,124	+11.4



COST OF LIVING INDEXES

	October 1940	October 1941	% Change	Sept. 1941	% Change Sept.-Oct.
Rent (Housing) Index, N.I.C.B.	87.4	89.4	+2.4	88.9	+0.7

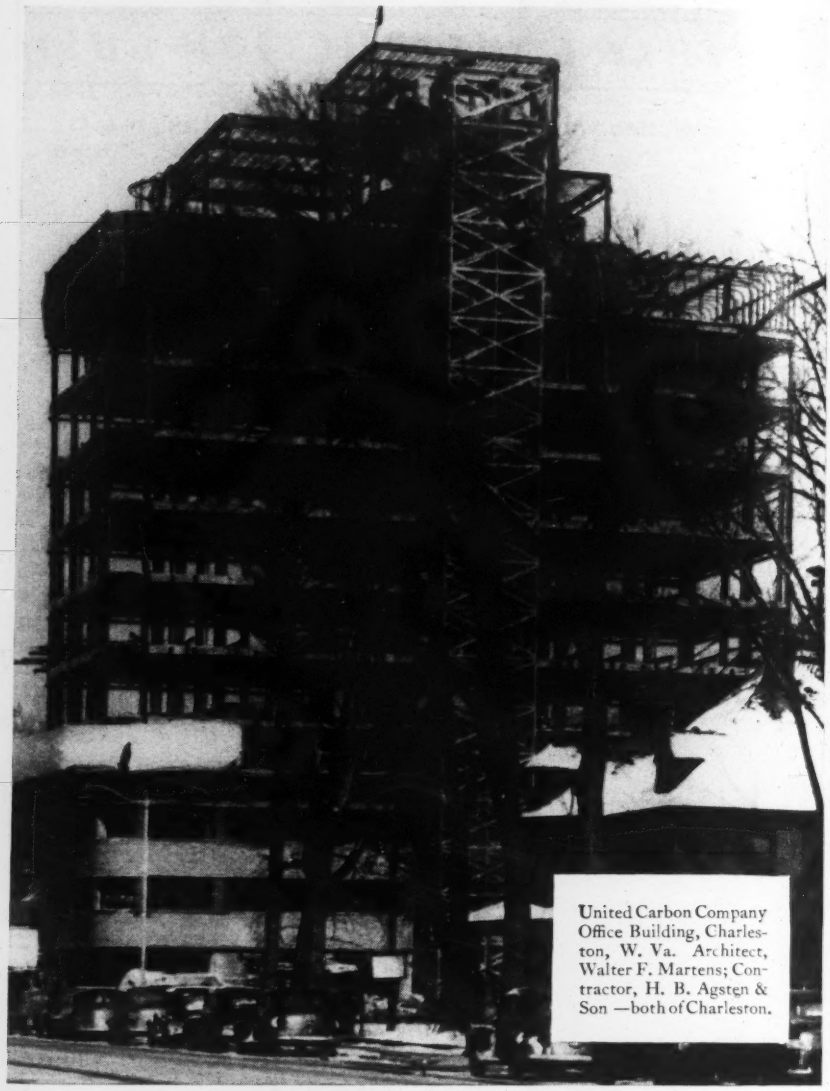
ENGINEERING CONSTRUCTION CONTRACTS——ENGINEERING NEWS-RECORD——NOVEMBER, 1941

Engineering News-Record *reports projects of the following minimum costs;—waterworks, excavation, drainage and irrigation,* $15,000*; other public works,* $25,000*; industrial buildings,* $40,000*; other buildings,* $150,000

Four Weeks—Thousands of Dollars (000 Omitted)

Public Works	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States November 1941	United States Eleven Months 1941	United States Eleven Months 1940	Canada
Waterworks	580	633	2,279	136	885	1,058	5,571	74,221	66,745	466
Sewerage	36	3,176	584	794	757	977	6,324	80,981	84,651	200
Bridges, public	491	926	2,381	1,049	1,165	135	6,147	101,850	103,296	120
Earthwork and waterways	184	2,460	634	670	2,736	1,686	8,370	238,985	221,324	.....
Streets and roads	1,267	6,950	6,794	3,327	11,120	3,312	32,770	552,424	634,335	364
Buildings, public	12,768	17,887	19,764	75,317	33,323	20,402	179,461	2,641,334	997,779	1,440
Unclassified, public	2,088	5,990	5,708	740	5,922	21,277	41,725	779,085	417,841	2,288
Total public	**17,414**	**38,022**	**38,144**	**82,033**	**55,908**	**48,847**	**280,368**	**4,468,880**	**2,525,971**	**4,878**
Federal government (included in above classifications)	14,428	21,919	26,339	72,182	37,807	48,716	221,391	3,332,838	1,233,289	.....
Private										
Bridges, private	.....	36	.....	.....	.....	.....	36	5,798	10,695	.....
Buildings, industrial	8,652	7,309	485	3,780	5,059	2,127	27,412	481,379	545,033	5,771
Buildings, commercial	1,900	20,244	884	2,934	2,200	5,889	34,051	459,463	359,973	1,100
Unclassified, private	74	2,360	510	600	2,524	865	6,933	183,490	146,867	572
Total private	**10,626**	**29,949**	**1,879**	**7,314**	**9,783**	**8,881**	**68,432**	**1,130,130**	**1,062,568**	**7,443**
Total Engineering Construction:										
November, 1941 (4 weeks)	**28,040**	**67,971**	**40,023**	**89,347**	**65,691**	**57,728**	**348,800**	.....	.....	**12,321**
October, 1941 (5 weeks)	16,581	123,634	68,422	54,339	60,424	82,932	406,332	.....	.....	23,558
November, 1940 (4 weeks)	22,462	92,111	66,911	55,992	89,835	55,413	382,724	.....	.....	16,583
Eleven Months—1941	**296,528**	**1,137,548**	**1,197,586**	**868,515**	**1,294,662**	**804,171**	.....	**5,599,010**	.....	**234,936**
Eleven Months—1940	234,549	841,256	759,632	672,590	635,863	444,649	.....	.....	3,588,539	243,266

SAVED 2 SETS OF FORMS— 72 DAYS



United Carbon Company Office Building, Charleston, W. Va. Architect, Walter F. Martens; Contractor, H. B. Agsten & Son —both of Charleston.

How Atlas High-Early cement helped to reduce costs and speed construction of this 12-story building

HERE'S a story of large savings in money and concreting time on this new office building. In reporting these savings after a careful study of his records, contractor H. B. Agsten & Son stated that Atlas High-Early cement helped in these ways:

TIME SAVED: 6 to 7 days concreting time on each floor. Total saving, 72 to 84 days!

FORMS SAVED: 2 complete sets of forms because Atlas High-Early cement permitted earlier stripping and reuse of forms.

FUEL COSTS: Saved $24 per floor for coke used to heat concrete during curing, a total of $288 on fuel.

Whenever speed in construction is necessary or economical, it will pay you to consider Atlas High-Early cement. Send for a copy of the booklet "Case Histories of Days and Dollars." It shows how many contractors have produced serviceable concrete in much less than the usual time—how it has saved them time and money on all kinds of jobs! Universal Atlas Cement Company (United States Steel Corp. Subsidiary), Dept. NR-12, Chrysler Bldg., N. Y. C.

OFFICES: *New York, Chicago, Phila., Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

NR-H-35

ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT

President requests funds for access road work

Congress asked for $75,000,000 cash and $50,000,000 contract authority, but no money for the strategic network is requested.

Money for the access road and flight strip program authorized under the emergency road bill was asked of Congress by the President last week. For access roads he asked $75,000,000 in cash and authority to contract for another $50,000,000. This indicates that $125,000,000 of the $150,000,000 program will be under contract, and $75,000,000 completed by next July.

No funds were asked to cover the $50,000,000 authorized for expenditure on the strategic network, but this does not necessarily indicate that the money will not eventually be spent. Of this sum, $25,000,000 is to be allocated to the states according to the federal aid formula. The allocations will be made soon, Public Roads Commissioner MacDonald told *ENR* this week. However, since they will simply be added on to the unobligated balances of federal aid money (currently some $114,000,000), it is unlikely that any cash will be needed this fiscal year.

The other $25,000,000 is to be distributed by the Federal Works Administrator to the spots where it is needed. Pending installation of General Fleming, the new administrator, no machinery for use of this authorization is being set up.

Priority aid restricted

It is becoming increasingly evident that, regardless of any legislative or executive action that may be taken, priorities are not going to be available to permit the spending of all the road money on hand during 1942. Already, as pointed out last week, priority aid is restricted, in practice, to access and network roads.

It now appears that the network roads, as such, will not long be receiving priority ratings. The strategic network has always been secondary to the access roads, and now, it is learned from sources close to the capital that the War Department is becoming even cooler toward the scheme.

Strategic network roads, broadly conceived as inter-regional highways, are not now considered as of critical importance to defense and are likely to be deferred. Increasingly, roads on the network will have to partake of the nature of access roads, and will have to be justified in terms of definite defense traffic between specific points in order to get priority.

The President asked Congress to appropriate the full $10,000,000 authorized for construction of flight strips near highways. The Army Air Force disclosed that it is working with PRA and the Civil Aeronautics Authority on determination of location of these auxiliary airfields. Most of them are to be in the Northeast, the Appalachian region, and the Northwest, generally five to fifty miles from existing airbases. They will have runways 3-8,000 ft. long, minimum cleared width of 300 ft. and surfaced width of 150 ft. In most cases runways will simply be sodded, but some will involve soil stabilization or hard surfacing. They will be built with federal funds but will be maintained by the states incident to regular roadwork.

Wide World Photo

Spectacular lifeline of the Chinese armies

This striking air view of a section of the Burma Road serves to emphasize the stupendous task undertaken by the Chinese engineers who built the road and the problem that they face in maintaining it against air attack. Recent Associated Press dispatches from Chungking state that plans are now being made to build a 700-mile pipe line to save hauling gasoline and oil over such grades and curves as the ones here shown.

Gen. Somervell promoted to general staff of Army

Brig. Gen. Brehon B. Somervell, whose administration of the construction division of the Office of the Quartermaster General during the past year has elicited so much praise, was appointed last week to be assistant chief of staff, G-4, in charge of the supply division of the War Department General Staff. In his new assignment he succeeds Brig. Gen. Raymond A. Wheeler, who is on detached service to develop port and rail facilities in the Near East.

Gen. Somervell, a graduate of West Point in 1914, has been one of the best known officers of the Corps of Engineers. He had a distinguished World War record, and has carried out many important peacetime assignments, including having charge of the Florida Ship Canal construction in 1935. In 1936 he was appointed Works Progress Administrator of New York City, a post he left last December to become Assistant Quartermaster General.

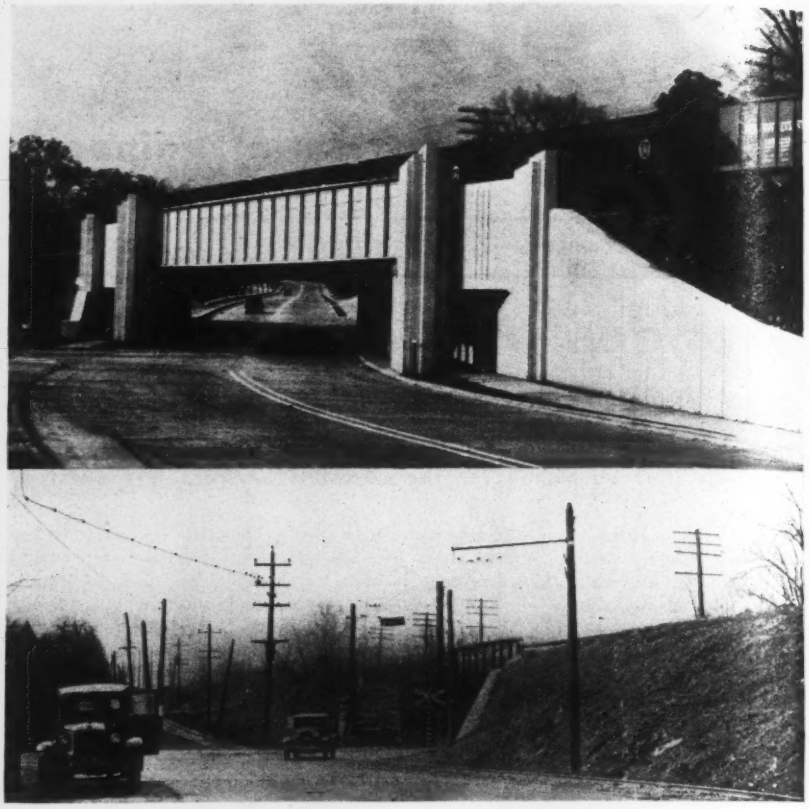
Inasmuch as the bill transferring all Army construction activities to the Corps of Engineers was signed this week by the President, it is not expected that General Somervell's former post will be filled. In this post he displayed unusual organizing ability and, by decentralization of authority, quickly raised the efficiency of the Army's construction program.

• • •

Radial well will dewater ground for Battery Tunnel

A radial-well type water collector, similar to those installed for industrial and municipal water supply uses, will be given its first trial as a ground dewatering device on construction of the Battery Tunnel, New York. An installation is now being completed by the George H. Flinn Corp. to facilitate initial tunnel excavation without compressed air. The tunnel is being built by the New York City Tunnel Authority, Ole Singstad, chief engineer.

The collector consists of a shaft, which is sunk to water bearing strata, on the bottom of which screen pipes are driven radially in a horizontal plane (see *ENR* July 31, 1941, p. 155). The shaft for the Flinn Corp. operations is 70 ft. deep, and is located on the Brooklyn end of the tunnel. The collector is designed to lower the water table sufficiently to permit excavation for the tunnel to be started in free air; the river section of the tunnel will be constructed under compressed air, however. Supervision of the installation is under the direction of Ross Nebolsine, acting for the Ranney Water Collector Corp. of New York City.



Ohio modernizes a railroad overpass

Ten miles northwest of Cincinnati, on Route 50 in Hamilton County, the Ohio Department of Highways has just finished modernizing an overhead pass for the Pennsylvania Railroad between Milford and Terrace Park, Ohio.

The span is of reinforced concrete and steel construction, 129 ft. 10 in. long, with steel girders and concrete deck, abutments and retaining walls, as shown in the illustration above. The lower view shows the old overpass.

The bridge is on a 67-deg. skew. During construction a two-track temporary trestle was constructed to permit both freight and passenger traffic of the Pennsylvania Railroad to be carried on without interruption. The temporary structure was built at a cost of $24,000, and the completed overpass cost was $213,700. Construction required the use of 433 tons of structural steel, 81 tons of reinforcing steel and 2,560 cu.yd. of concrete.

The contract was held by Contractors Finance Corp. of Cincinnati, Ohio.

Americans to build war facilities in Middle East

Rumor that some prominent contractors are assembling construction forces for overseas work on docks, highways and railroads is confirmed by a report that the Lease-Lend administration is arranging for construction of facilities in the Red Sea area and at Basra, Iraq and Bandarshah, Iran. War supplies have been going to the Red Sea terminals for some months but it appears that more volume has forced construction of additional facilities.

In Iraq and Iran a mission under Brig. Gen. R. A. Wheeler will improve port facilities and build up and extend the railway system of the two countries and develop highways to deliver munitions to the Russian forces.

The Searchlight pages of this issue carry an advertisement for skilled men for overseas construction. Particularly desired are operators for all kinds of construction machines necessary to work in undeveloped areas.

Superintendents, foremen and auditors are also asked for. Work contracts are for one year with all expenses paid and remuneration about one and one-half times the usual rate here.

Engineers have applied for overseas jobs in such numbers that they appear to be less in demand at present than construction men.

Personnel will be more rigorously examined than has been the case on the offshore base work, to eliminate the necessity for replacing those physically and mentally unsuited. Preference will be given those who have had experience in development of new areas or have held jobs requiring unusual endurance.

Major administration changes in new $300,000,000 defense housing bill

Bill would require all future defense housing be built by Public Buildings Administration, except construction assigned to the Army or Navy. Cost limits raised in recognition of rising prices.

Expenditure of an additional $300,000,000 on defense housing is authorized in a bill reported out last week by the House committee on buildings and grounds. The bill would also introduce major changes into the administration of the defense housing program. To date, a little under a half billion dollars has been provided for defense housing, and most of it has been assigned to projects.

The new bill would require that all future defense housing be built by the Public Buildings Administration except as construction might be assigned to the Army or Navy. At present, construction is split up among many agencies—PBA, USHA, two newly created divisions of FWA, Farm Security Administration, and even TVA—as assigned by the Federal Works Administrator. In recognition of rising costs, permissible average cost of dwelling units is raised from $3,500 to $3,750 and maximum cost from $3,950 to $4,500.

Use of prefabricated houses would apparently be interfered with by a requirement that, in the interest of ready sale after the war, houses must conform in construction to local practice. On the other hand, the bill directs that houses for which no post-war use is seen can be of temporary construction.

The bill would also make a number of changes in the economic set-up of the projects designed, apparently, to stimulate private building by putting the government houses competitively on a par with private housse. Where the present Lanham Act directs that rents for defense houses be set at levels which defense workers can afford to pay, the new bill requires that rentals be high enough to make the project self-supporting, except that rent on housing for families of enlisted men shall be set by the Army or Navy.

It is probable that some of these provisions will be modified in the Senate.

• • •

Tacoma Bridge steel to be salvaged for scrap

Some 3,500 tons of scrap steel in the towers of the wrecked Tacoma Bridge, originally scheduled to be dropped into Puget Sound, will be salvaged and eventually routed into the nation's defense program, the Office of Production Management announced last week. The "rescue" of the scrap steel was accomplished through the joint efforts of several branches of OPM and the State of Washington Toll Bridge Authority.

Carlton S. Proctor, chairman of the committee on steel conservation and reclamation of the Engineers' Defense Board, on Nov. 13 notified OPM officials of a decision to drop the damaged bridge structure and cables into Puget Sound. The decision had been reached, it was said at that time, because the cost of reclamation exceeded the immediate scrap value of the metal. After an exchange of telegrams, the Scrap Iron and Steel Division of OPM received assurance from the Washington Toll Bridge Authority that it "will offer for sale all scrap which can be made available."

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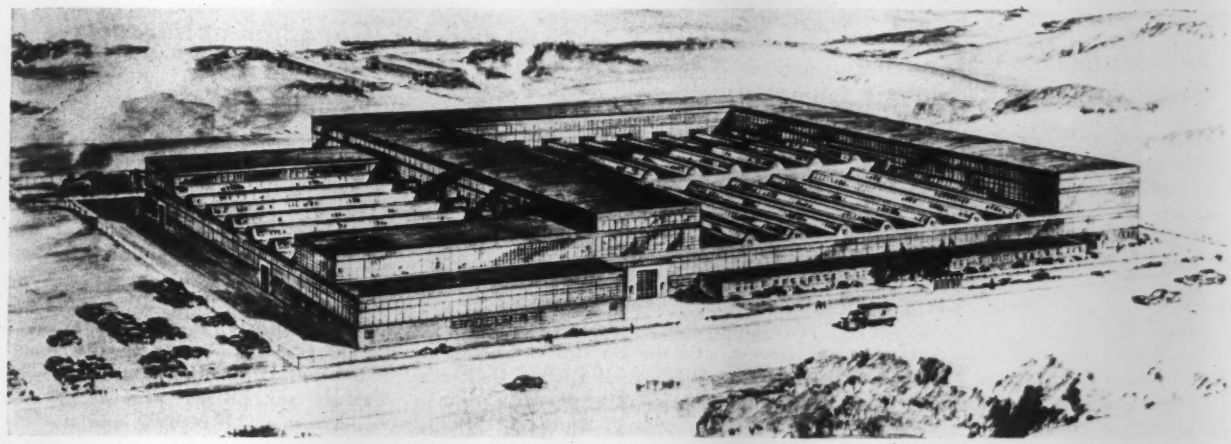
Engineer Corps takes over all Army construction

President Roosevelt, on Dec. 2, signed the bill recently passed by Congress transferring the construction operations of the Quartermaster Corps to the Corps of Engineers. By the consolidation the Engineers become the design and construction organization of the Army in fact as well as in name, and in peace as well as in wartime. The historic Army setup confined the construction operations of the Engineer Corps to the theater of war, leaving "behind the lines" work to the Quartermaster. In the present emergency the Engineers had been given airbase constructions by executive order, and the new bill now transfers all other construction to them. In commenting on the new setup, Maj. Gen. Eugene Reybold, Chief of Engineers, stated that the consolidation brings under one head a $3,500,000,000 construction program.



New plant to expand production of diesel engines for U. S. Navy

With $5,500,000 available, Fairbanks, Morse & Co. will soon start construction on a new plant at Beloit, Wis., which will be devoted to the production of diesel engines to power U. S. Navy submarines, cruisers, destroyers, etc.

This structure will be 660 ft. long and 460 ft., wide with a floor area of more than 300,000 sq.ft. Contained in the new building will be a large machine shop, welding shop, storage facilities for raw and processed materials, assembly floor, erecting floor, test floor, painting and shipping departments, first aid hospital, conference rooms and offices, and suitable provision for production and planning departments and engineers. The building will be of concrete, brick and steel construction. Daylight illumination will be provided by large areas of clear glass window panels, and sawtooth skylight roof.

W. Fred Volke, Chicago, is architect, and Cunningham Bros., Beloit, Wis., are engineers.

Allocation and prices affect steel and roofing

Plate, perhaps the scarcest form of steel, was this week subjected to full allocation by the Priorities Division of OPM. Currently plate orders with an A-10 or better rating exceed the production of this item. Under the new order, plate producers must submit each month to OPM a schedule of estimated production and of proposed shipments, together with a list of orders which they do not propose to fill. The schedules will be reviewed by OPM and any desirable modifications made before shipments can be made by the producers.

For the present, plate buyers continue to submit their orders in the usual way to their regular suppliers. Eventually they will probably be required to submit detailed advance estimates of requirements and the use to be made of the steel.

This is essentially an interim arrangement pending the working out sometime early next year of an industry by industry allocation system for steel. At that time specific quantities will be alloted in advance to the various branches of the construction industry. Studies to make this possible are now being carried on by the construction branch of OPM.

Manufacturers prices of asphalt and tarred roofing have been frozen by the Office of Price Administration at levels 5-10 percent below those now prevailing. Prices of these products have risen about 16 percent during 1941. The OPA order establishes prices for standard products in the East, and in the seven West Coast states the order freezes prices at the July 2 level.

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Regional offices of DPW regrouped by FWA

John N. Edy, acting federal works administrator, has announced effective Jan. 1, a regrouping of Defense Public Work regional offices will be made, and that offices will be opened in New York and at Atlanta, Ga., while offices in Philadelphia, Boston, Jacksonville, Detroit, Kansas City and Denver will be consolidated with other regional offices.

The regrouping and reduction of regional offices from 11 to 7 will in no way interfere with the receipt of applications or the processing of pending applications, said Mr. Edy. It was pointed out that in the $150,000,000 program now in the construction stage the regrouping would present a more convenient geographical arrangement for supervision of construction and would also result in more economic operation.

The regrouped regions are as follows: Region 1, office in New York, N. Y., will comprise the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, and New Jersey.

Region 2, offices in Richmond, Va., will comprise the states of Delaware, Maryland, West Virginia, Virginia, North Carolina, and the District of Columbia.

Region 3, office in Atlanta, Ga., will comprise the states of South Carolina, Tennessee, Georgia, Alabama, Mississippi, and Florida.

Region 4, office in Fort Worth, Tex., will comprise the states of Arkansas, Louisiana, Oklahoma, and Texas.

Region 5, office in Chicago, Ill., will comprise the states of Ohio, Kentucky, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, South Dakota, and North Dakota.

Region 6, office in Los Angeles, California, will comprise the states of Colorado, New Mexico, Utah, Arizona, Nevada, and California.

Region 7, office in Seattle, Washington, will comprise the states of Washington, Oregon, Idaho, Montana and Wyoming.

Brig. Gen. Kingman retires

The War Department announced last week that Brig. Gen. John J. Kingman, Assistant Chief of Engineers, retired on Nov. 30 on his own application after more than 41 years of active military service in the Corps of Engineers. For the past year he has been head of the fortification section.

Following distinguished service in the World War, General Kingman served in the war plans division of the War Department General Staff, as commanding officer of the 1st Engineers at Fort Dupont, Del., and on river and harbor work in various sections of the country. He was district engineer at Milwaukee, at Providence and at Boston. His last post before becoming Assistant Chief of Engineers in January, 1938, was in San Francisco, where he was in charge of river and harbor improvements in the Southern Pacific Division.

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Construction workers received merit award

A system of extending recognition to individual workmen for exceptional craftsmanship on outstanding construction projects was inaugurated last week by the Building Congress and Exchange of Baltimore, Md. At a dinner meeting of the organization, 18 workmen received bronze merit buttons in recognition of excellent and exceptional craftsmanship on various construction jobs completed recently in Baltimore.

Besides individual awards, certificates of merit were presented to 19 firms for excellent work on outstanding local building projects. The building congress has been awarding merit certificates to sub-contractors or firm winners for the past three years. In announcing the awards, Stewart W. Parker, executive secretary of the congress, said, "although merit certificates have been issued to sub-contractors, we felt that something was lacking, and that recognition was not getting right down to the foreman or the mechanic who was most responsible for the excellence of the work. And this is the reason why we have decided to recognize individual workmen who are deserving of the honor."

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Canadian action delays Alaskan highway project

Report of the British Columbia, Yukon and Alaska Highway Commission was tabled in the Canadian House of Commons late last month.

The commission recommended as preferable a route running from Prince George to MacLeod Lake, Finlay Forks, Sifton Pass, the Liard River and Frances Lake, down the Pelly River and then northwestward to Dawson City, Y.T., thence across to Alaska. The report stated that 1,180 miles of new gravelled highway will be necessary at an estimated cost of $18,000,000, and that improvements to existing roads, engineering charges, and contingencies will bring the total cost to at least $25,000,000. Five or six years will be required for construction.

Since the Canadian House of Commons has tabled the report, it is hardly likely that any serious consideration will be given to the project until after the war.

Tulelake reclamation tunnel lining complete

Concrete lining of the Tulelake reclamation drainage tunnel in Siskiyou County, Calif., has been finished; installation of pumps, pipe lines, power house and other equipment will be completed by the end of the year.

The 6,600-ft. tunnel was driven through the hills west of the sump area where waste irrigation water from the entire Klamath Basin is impounded. Water from this area, which covers several thousand acres, will be pumped into Lower Klamath Lake on the other side of the mountain range, the water being lifted 62 ft.

Excavation of the tunnel was started last December at the east portal. Contract allowed 500 days for digging and lining, and the last barrier was cut through last May.

J. A. Tertling & Sons of Boise, Idaho, held the concrete lining contract under the direction of the Bureau of Reclamation.

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Low accident record on army construction

The War Department has announced that during the first nine months of 1941 there were 81 fatalities and 9,981 lost-time accidents on the $2,000,000,000 Army construction program directed by the Quartermaster General.

Despite these accidents the safety standards on the projects, which include munitions plants, camps, cantonments, depots, and harbor defenses, have exceeded all previously known safety records for large scale building operations. The Army estimates that it had a 24.2 percent lower accident frequency rate than the construction industry generally, which is 33.47 lost-time accidents per 1,000,000 man hours worked.

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Largest wind tunnel to be built at Moffett Field

For testing full-scale aircraft under controlled conditions, what is believed to be the world's largest wind tunnel is to be built at Moffett Field, Calif. Towering 200 ft. into the air, it will measure 900 ft. in length and 400 ft. in width, and will cover 10 acres of ground. This mammoth structure will dwarf by comparison the present largest wind tunnel located at Langley Field.

Construction contract has been awarded by the National Advisory Committee for Aeronautics to the Pittsburgh-Des Moines Steel Co. The project will be completed early in 1944. The contract calls for an expenditure of about $5,000,000.

Engineering curricula accredited in 129 schools

The Engineers' Council for Professional Development, through its committee on engineering schools, has announced that 460 engineering curricula have been accredited at 129 colleges and universities in the continental United States. The committee, of which A. A. Potter, dean of engineering at Purdue University, was chairman in 1939-41, conducted the accrediting program.

Since the establishment of the program in 1933, 143 of approximately 166 institutions granting engineering degrees in the United States and Alaska have submitted curricular for inspection. In 1939 the committee began reinspecting previously accredited curricula.

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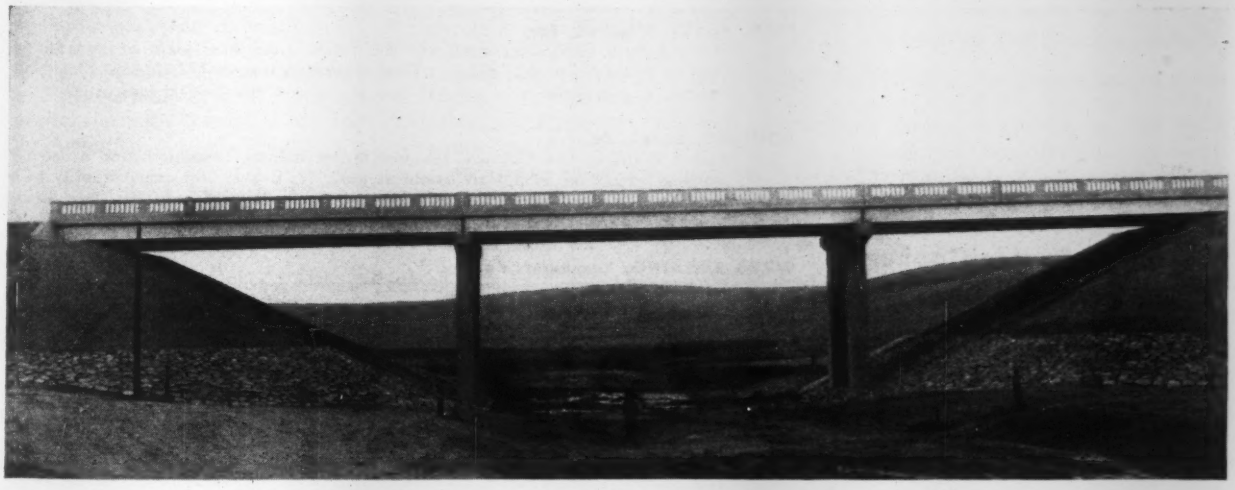
New Tacoma Narrows Bridge model to be tested

A wind tunnel, 40x130 ft., equipped with ten propellers will be erected on the University of Washington campus for wind tests to be conducted by Prof. F. B. Farquharson on a large-scale model of the proposed new Tacoma Narrows Bridge. Funds necessary for building the tunnel have been allocated by the Washington State Highway Department.



South Dakota prefers long spans to excessive fills

The South Dakota State Highway Commission has found it more economical to increase the length of small bridge structures rather than design approaches using excessive fill and the use of cantilever and counterforted abutments; a typical example being illustrated above. This 206-ft. structure on U. S. Route 77 consists of I-beam spans and was built at a cost of $26,903.

This type of bridge was used to span valleys and small streams on the last 19 miles in a program of hard-surfacing 210 miles on U. S. Route 77. Contractors for the span were W. Bonesteel, of Wagner, and A. L. Hyde, of Watertown, S. D. S. W. Gentle, of Salem, was resident engineer for the South Dakota State Highway Commission.

Hard-surfacing of this strategic highway was begun in 1928 when concrete was laid between Elk Point, S. D. and Sioux City, Iowa, a distance of 10 miles. In 1932 and 1933, 15 miles of concrete paving was completed north of Sioux Falls. In the succeeding years the route was surfaced in sections with concrete or asphalt according to traffic density. Today there are 117.5 miles of concrete and 73.5 miles of bituminous surface along the route. The remaining 19 miles have been regraded and surface gravel added to carry traffic through the winter. Final contracts will be let early next spring by the highway commission for completion of the project. This highway carries 11.4 percent of all commercial traffic and 10.8 percent of all foreign traffic on the South Dakota highway trunk system.

Pennsylvania to start survey on Pitt Parkway

I. Lamont Hughes, secretary of the Pennsylvania Department of Highways, has announced that the department, in cooperation with federal authorities, is ready with funds to begin surveys for construction of the Pitt Parkway, to carry U. S. Routes 22 and 30 into Pittsburgh. Surveys and plans will cost about $400,000, and more than a year will be spent on this initial part of the work.

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Kentucky opens major section of 537-mile road

With the opening of the new $1,500,000 Shelbyville-Frankfort stretch of highway U. S. 60 the middle of this month, the state of Kentucky is fast completing one of the longest paved roads, within a single state, in the country.

With the exception of a short gap between Frankfort and Lexington and another in Boyd County, the concrete highway now stretches 537 miles from Wickliffe to Catlettsburg. These gaps will be filled during next year's highway construction program. The section just completed has two lanes from Frankfort to Shelbyville and will have a three-lane approach into the city of Frankfort.

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Mobile gets $5,000,000 defense housing project

A housing project, which includes 1,410 dwelling units, has been approved by the division of defense housing coordination in Washington for Mobile, Ala. The estimated cost of the project is about $5,000,000.

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Power at Santee-Cooper to be turned on Dec. 31

With the transformer units nearly complete downstream from the power house at Santee-Cooper Dam, the hydro-electric power project which is being built 50 miles north of Charleston, S. C., is expected to be ready for initial operation by Dec. 31.

Generating equipment at the power house consists of four 40,000 hp. turbines directly connected to four 34,000 kw. ampere-generators, and one 13,300 hp. turbine directly connected to one 11,350 kw. ampere-generator. Provision is made for an additional future 40,000 hp. unit. The 34,000 kw. ampere-generators (three-phase 60-cycle alternators) generate at 13,800 volts. The transformers will step up the voltage from 13,800 to 66,000 for delivery to the transmission lines.

JOBS OF THE WEEK

ORDNANCE PLANT, Geneva, Pa.
Fraser-Brace Engineering Co., Inc., New York, N. Y. has been awarded a contract to construct a number of buildings at Keystone Ordnance Works, near Geneva, by the War Department, Washington, D. C. Estimated cost of the work is $35,000,000.

MAINTENANCE and COMMAND BUILDING, Dayton, O.
James I. Barnes, Dayton, O. has been awarded a contract to construct a maintenance and command building at Patterson Field in Dayton, Ohio. Contract was let by U. S. Engineers at Wright Field. Cost of construction is $1,596,999.

SHIPWAYS, Sparrows Point, Md.
Bethlehem Shipbuilding Co. has placed contract with McLean Contracting Co. of Baltimore, Md., to construct three concrete shipways and shop buildings at an estimated cost of $2,000,000.

RACE TRACK, North Haledon, N. J.
Edward H. Ellis, Inc., Westville, N. J., will construct a 1 mile dirt track, grand stand, stables, etc. on Route 40, for Garden City Racing Association, Vineland, N. J. Estimated cost is $1,500,000. Sloan & Behrens, New York, N. Y. are architects, and J. C. Remington, Jr., Camden, N. J. is engineer.

SEWAGE DISPOSAL PLANT, INCINERATOR and SEWERS, Stamford, Conn.
Thompson Starrett Co., New York, has been awarded general contract for construction of a sewage disposal plant for Stamford, Conn. at a cost of $855,226. Outfall sewers will be placed by Paul Bacco, Stamford, Conn., at a cost of $177,334; and contract for an incinerator was awarded to Caulway, Inc., New York, N. Y., on a bid of $105,500. Solomon & Keis, Troy, N. Y. are engineers, and W. Raisch, New York, is architect.

AIR BASE FACILITIES, Territory of Hawaii and Pacific Islands.
Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded a supplemental contract for additional facilities in Hawaii and Islands of the Pacific, to Hawaiian Associates, New York. Estimated cost is $59,887,910. Hawaiian Associates is made up of Raymond Concrete Pile Co., Hawaiian Dredging Co., Turner Construction Co., Morrison-Knudsen Co., Inc., J. H. Pomeroy & Co., Inc., W. A. Bechtel Co., Utah Construction Co. and Byrne Organization.

STEEL PLANT, Houston, Tex.
Sheffield Steel Corp. will construct blast furnace and steel plant by own forces. Defense Plant Corp. will finance. Total estimated cost is $22,670,855. Plant will have an annual capacity of 274,000 tons of pig iron and 210,000 tons of steel.

HOUSING, Baden, Pa.
Sherry Richards Co., Chicago, Ill., was lowest bidder for constructing a defense housing project on John Hall Estate at $997,773. Beaver Housing Authority took bids Nov. 25 for USHA. Martsolf, Bretand & Bradley, Monaca, Pa., are architects. E. S. Tower, Pittsburgh, is mechanical engineer.

WARD BUILDING, Pennhurst, Pa.
Henry E. Baton, Inc., Philadelphia, Pa., received general contract on constructing two ward buildings at Pennhurst State School from General State Authority, 2nd and Locust Sts., Harrisburg, Pa., at a cost of $621,600; heating and ventilating was let to John F. Moleski, Kulpmont, Pa., at $78,780; plumbing and drainage work let to W. M. Anderson Co., Phila., Pa., at $51,987; electrical work was awarded to W. V. Pangborne & Co., Phila., Pa., at $37,644.

OPTICAL BUILDING, Frankfort, Pa.
Hughes-Foulkrod Co., of Philadelphia, Pa., has been awarded a contract by the Constructing Quartermaster, at Frankford Arsenal, to construct an optical building. Estimated cost is $742,000.

NAVAL BASE, Labrador.
Dominion Construction Corp., Ltd., Toronto, Ont., has been awarded a contract for the construction of a naval base, including water and sewage systems, houses, stores, roads, machine shops and naval docks, by Department National Defense for Sea, at Ottawa, Ont. Estimated cost is $2,500,000-$3,000,000.

FLOOD GATES, Freeport, Tex.
Tellepsen Construction Co., of Houston, Tex., was lowest bidder for constructing flood gates and buildings on Brazos River of the Intracoastal waterway, 4 mi. southwest of Freeport, at $1,303,886. Bids were opened by U. S. Engineers, Galveston, Tex.

NOTE—Additional bidding and contact news on over 800 projects large and small appear in the Construction News section beginning on page 141.

OBITUARY

WALTER M. DUNAGAN, associate professor of Theoretical and Applied Mechanics at Iowa State College, died Nov. 24, as the result of an emergency operation for a stomach ailment. He was 47 years old. He had long been interested in construction and engineering materials, his best known technical contributions being the result of his researches and writings in the field of concrete. He had taught at Iowa State since 1924. Prof. Dunagan was the inventor of equipment widely used in the analysis of fresh concrete; the author of two important bulletins of the Iowa Engineering Experiment Station, one on the Field Control of Concrete and the other on the Use of Color in Concrete; of a manual for use in the teaching of courses in plain concrete, and of several technical papers and discussions published in the proceedings of the American Concrete Institute and the American Society for Testing Materials. About five years ago he developed a type of reinforced tile floor construction which already has gained wide acceptance and use.

JAMES G. ALLEN, principal office engineer of the Tennessee Valley Authority, died recently at Knoxville, Tenn. Mr. Allen was a graduate of Virginia Military Institute and worked on design and construction of major engineering projects for several years having joined TVA in its earlier days. He started with TVA in the Construction Plant Division, and was soon advanced to the position of assistant to the construction engineer of the Authority.

DANE MCNEILL, 70, civil engineer, died at Marble Falls, Newton County, Ark., Nov. 27.

HERBERT TERRY GREEN, 63, of Milan, Tenn., died Nov. 21 at Little Rock, Ark. Mr. Green was a member of the engineering staff of the H. K. Ferguson Co., Cleveland, Ohio.

JASPER N. BISHOP, 52, chief maintenance engineer for the Oregon State Highway Commission, died Nov. 25, at Salem, Ore.

ROBERT E. MIDDAUGH, 55, engineer for the U. S. Bureau of Reclamation, died at Shasta Dam, Nov. 22.

CONTRACTS AND CAPITAL

ENGINEERING CONSTRUCTION awards for the week total $93,488,000, a decline of 15 percent both from last week's volume, and from the award figure for the corresponding week last year.

Private awards are 64 percent under a week ago and 54 percent below a year ago. Public construction is 0.5 and 7 percent lower, respectively, than last week and last year despite the gain in federal work which tops the preceding week by 11 percent, and is up 4 percent compared with the 1940 week.

The current week's total brings 1941 construction volume to $5,692,498,000, an increase of 54 percent over the $3,699,042,000 for the 49-week period last year, and 43 percent above the total for the entire year 1940. Private awards for the period, $1,139,235,000, are up 5 percent, and public construction, $4,553,263,000, is 74 percent higher than in the 49 weeks of 1940 due to the 162 percent gain in federal work.

New capital for construction purposes for the week totals $14,297,000. This compares with $169,256,000 for the corresponding week a year ago. The current week's financing is made up of $6,040,000 in state and municipal bond sales, $4,257,000 in corporate security issues, and $4,000,000 in Defense Plant Corporation loans for industrial construction.

New construction financing for the year to date, $6,296,594,000, is 66 percent above the $3,780,246,000 reported for the 49-week period last year.

CONTRACTS

(Thousands of dollars)

	Week Ending Dec. 5 1940	Nov. 27 1941	Dec. 4. 1941
Federal	$68,374	$63,648†	$70,895
State & Municipal	22,395	21,099†	13,488
Total public	$90,769	$84,747	$84,383
Total private	19,734	25,584	9,105
TOTALS	$110,503	$110,331	$93,488

Cumulative
1941.....(49 weeks).....$5,692,498
1940.....(49 weeks).....$3,699,042

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.
† Revised.

NEW PRODUCTIVE CAPITAL

	Cumulative 1940 49 weeks	1941 49 weeks
NON-FEDERAL	$1,498,285	$1,345,476
Corp. Securities	375,105	357,126
State & Mun.	484,564	405,609
U.S.H.A. loans	218,704	30,399
R.F.C. loans	195,912	288,842
R.E.A. loans	40,000	100,500
Federal Aid—Hwy.	184,000	163,000
FEDERAL	$2,281,961	$4,951,118
TOTAL CAPITAL	$3,780,246	$6,296,594

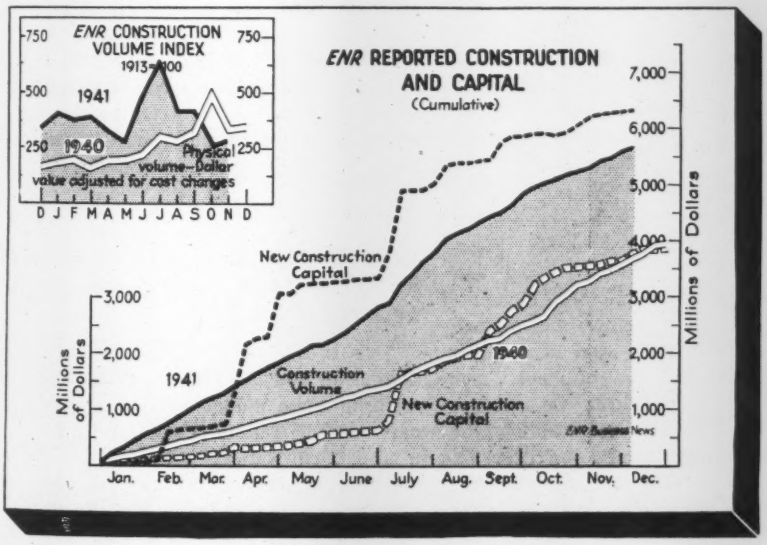
FHA MORTGAGES

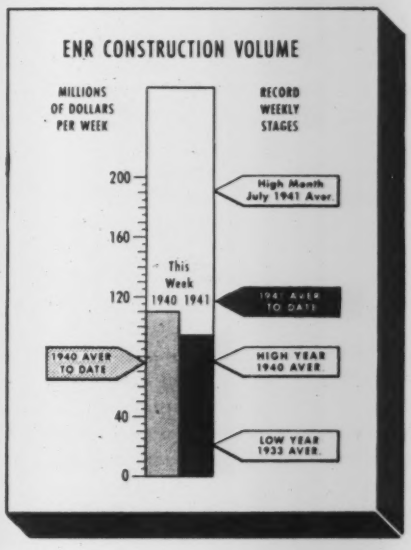
	Week Ending Nov. 30 1940	Nov. 22 1941	Nov. 29 1941
Selected for appraisal (Titles II and VI)	$20,556	$22,844	$23,103*

Cumulative
1941.....(48 weeks).....$1,333,161*
1940.....(48 weeks).....$1,186,487
* Subject to revision.

ENR INDEX NUMBERS

Index Base = 100	1913	1926
Construction Cost..Dec. '41	266.16	127.94
Building Cost.....Dec. '41	216.37	116.96
Volume .....Nov. '41	282	124


ENR CONSTRUCTION VOLUME INDEX 1913=100
1941
1940
Physical volume—Dollar value adjusted for cost changes
D J F M A M J J A S O N D
ENR REPORTED CONSTRUCTION AND CAPITAL
(Cumulative)
New Construction Capital
Construction Volume
1941
1940
New Construction Capital
Millions of Dollars
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.


ENR CONSTRUCTION VOLUME
MILLIONS OF DOLLARS PER WEEK
RECORD WEEKLY STAGES
High Month July 1941 Aver.
This Week 1940 1941
1941 AVER TO DATE
1940 AVER TO DATE
HIGH YEAR 1940 AVER.
LOW YEAR 1933 AVER.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Teaching Engineering Under War Conditions

The following letter, written by a professor in one of the British engineering schools to a former associate now teaching in one of the Canadian universities, gives such a vivid picture of the way in which British engineers are carrying on despite bombing and other difficulties incident to the war that the editors of Engineering News-Record *asked the British Censorship for permission to publish it. Permission was granted, provided names of places and persons were deleted.*—THE EDITORS.

Thanks for your letter. Yes, we are still carrying on here *and* trying to keep up the standard—but more of this anon. You will have heard that a land mine struck the engineering building, destroying the whole corner comprising civil engineering class room (top floor), engineering library, and 4th-year mechanical design (next floor), refrigeration lab. (flying floor) and oil-engines lab. The Blackstone oil engine (25 hp.) was hurled 60 ft. across the lab. and up the stairs! So you can see the forces set up. Not a pane of glass left in the whole university—but no structural damage to the "Lavatory Gothic" Victoria Building!

Our steam plant is not damaged but as we cannot now get oil we are converting the boilers back to their original coal firing. Testing of materials plant all safe. The central well stairs are not safe for a large number of students to come down at a time so we are building a temporary wall blocking off the whole of the damaged portion and "throwing bridges" across to each wing. The technical school has offered us the use of its labs whenever we require—so I am taking groups down to run some diesel tests at the moment.

One night in six I spend at the university fire-watching. When the sirens go we climb up to a balcony on the clock tower just under the clock face from which we have a wonderful (and sometimes dreadful) view of the city, and more particularly the scattered university property. My first "bad" night was the second night of the eight-day blitz—showers of incendiaries, H.E. and land mines—and fortunately the job of reporting fires, etc., kept one so busy that there was no time to "think." Unless anyone has witnessed a blitz I don't think he can possibly realize what heroes the A.F.S. men are.

If only the open spaces now formed could be left, our city would become a beautiful city yet! There is now a view of the waterfront!

There are many lessons we have learned from unexpected happenings—for instance the India buildings were burned out not from direct hit, but by the windows being shattered by blast and then all the blackout curtains catching fire from a burning building opposite, the fire watchers having no chance to tackle so many points at once.

I am no longer in the Observer Corps as the university asked me and the Registrar to take up commissions in the newly formed Air Squadron. So I am now a Pilot Officer R.A.F. V.R. in my spare time lecturing in navigation, theory of flight, and any other odd job that comes along! We have a resident regular wing commander and adjutant and the strength will be next session about 100, we hope. Unfortunately just as we had got really going, our wing commander without warning has been posted out East and a new one has just arrived and has to start from scratch, not having been on the training side before! All male students next session must join the O.T.C. or the Air Squadron (unless C.O.'s, when they will have to do fire watching or some other duties). I believe the women also are to do some work of national importance while in residence.

And now as regards the courses. We are definitely maintaining the standard of the courses—or trying to. In certain cases if the work has suffered due to a blitz, etc., a lower standard of necessity must be accepted and the course curtailed somewhat—but while we shall in marking give every consideration to the stress of external circumstances, *we are doing our best to make the degree worth having.* All students who are called up before completing their course (this does not apply so much to the engineers at the moment, as most are reserved and will probably be able to finish if they show promise from their exam results) are strongly advised to return when the war is over and finish their full course so that their degree will mean something. If for financial or other reasons like age and necessity of getting a job, this is found to be impossible—then the university will consider the granting of a "war degree" if the student has satisfied certain minimum requirements and has served his country for a certain period. Some universities have already published their requirements for a war degree—but we hope to be able to avoid such degrees in general as they were found after the last war to be a hindrance rather than an asset.

Thus to sum up, our attitude is that if a man is granted the privilege of coming to the university in wartime he has got to put up a good show both in his work and in the small amount of military training imposed, so that on leaving he may be of real value to the country, while the granting of a degree will carry the distinction it deserves and not bring the university into disrepute by "flooding the country" with a lot of half trained men.

The attitude of the War Office and Air Ministry up to the moment is that they would like young men who are just leaving school and who would normally have come to the university, to still come to the university even if only for one or two years rather than join up in the services straight away, as they realize that the training they receive is just what is required as the preliminary to consideration for a commission.

Re Model Tests on a Retaining Wall

Sir: In the Nov. 6 issue, there appeared an article by C. U. Prout describing some model tests on a precast concrete retaining wall and also a model crib wall.

There is serious objection to the conclusions reached by Mr. Prout concerning the model crib wall, be-

cause of the method of measuring the resulting reactions on the base of the crib from backfill. As is indicated in the diagram showing the testing apparatus, the sand within the crib was solidly supported by the bottom of the box and measurement was made only of the reactions transmitted through the front and rear lines of the crib proper. The results may be taken as a test of the loads acting on the crib members, but no conclusion can be drawn concerning the action of this model as a replacement of a retaining wall. Undoubtedly the sand within the crib acts with the crib members. However, there is no indication from these results what are the true base pressures acting on the soil underneath the crib. The crib members themselves may be strong enough to hold together as a bin and yet there can be failure of the entire unit as a retaining wall.

As stated in the beginning of the article, the tests were undertaken because "several walls with a proportion of 6-ft. base width to 24-ft. height have withstood years of service with no indication of instability." With the negative batter of this type of crib wall, such a condition is not to be considered an unexpected phenomenon. Retaining walls of a similar ratio of numerous kinds of materials have stood and should stand under earth pressure.

There are a great number of advantages of the crib type wall, but I doubt very much whether the design of such walls can be based upon the tests described. It seems that the manufacturers of this material could very well have made, or should make, full size tests to provide data on their strength and stability.

JACOB FELD
Consulting Engineer, New York

Cost of Flame Cleaning

Sir: While perusing the Nov. 6 issue of *Engineering News-Record*, I read with interest your abstract of the report on "Recent Developments in Paint Removal" which was presented at the annual convention of the American Railway Bridge and Building Association held in Chicago.

As chairman of that committee I would like to call your attention to the inadvertent misrepresentation of cost figures in conjunction with the comparison of flame cleaning versus hand cleaning of structural steel. Your abstract reads, in part, as follows: "In the cleaning of a train shed, a certain amount of work cleaned by hand required 26.1 man-hours and a labor cost of $18.27, while an equal amount done by the flame method required 13 man-hours and represented a labor cost of $17.50."

If you will refer to the report you will find that the time and cost of flame cleaning in that instance was referred to as follows: "Flame cleaning required 13 man-hours and the total cleaning cost of labor and material amounted to $17.50 per beam." From this reference you will note that $17.50 represented a total cleaning cost of labor *and material*.

I am bringing this to your attention principally because the abstract material as presented reflects different wage rates for hand versus flame cleaning, whereas in this test the same gang was used and the total cost of the flame cleaning includes the cost of the oxygen and acetylene as well.

C. MILES BURPEE
Chairman, Committee No. 8
Recent Developments in Paint Removal
American Railway Bridge & Bldg. Assn.
Chicago, Ill.

Structural Welding Standards

Sir: Referring to James D. Marshall's letter in your October 9 issue (p. 479) he makes the constructive suggestion that the American Institute of Steel Construction might well cooperate with the American Welding Society in developing a set of standard welded beam connections. By way of explanation as to what has and is being done in this connection, I advise as follows:

In December, 1939, the Institute published "Recommended Fundamental Principles, Tentative Minimum Requirements and Tentative Welded Connections for Tier Buildings", developed by the A.I.S.C. Committee on Welding. These welded connections for tier buildings have been in wide use since their publication and are now accepted as standard, so far as they go. It is, and has been, the intention of our Committee on Welding to develop from time to time further recommendations regarding welded details for building frames, and much study has recently been given to the matter of the development by the Building Code Committee of the American Welding Society of an entirely rewritten edition of the A.W.S. Code for Arc and Gas Welding in Building Construction. This document is the result of the work of revision carried on by this committee for the past year or so and is distinctly a code and not a general specification.

The Institute has, in the meantime, carried on the preparation of a complete specification for the design, fabrication and erection of structural steel for buildings by arc and gas welding. This specification will in all respects conform to the requirements of the Welding Society's Building Code and be parallel in form to the Institute's standard specification for riveted building construction. It is expected that both the code and specification will be published soon.

The A.I.S.C. Committee on Welding has, for obvious reasons, delayed the promulgation of further welded connection standards until the completion of the aforementioned code and specification, but the Institute committee has now in hand the matter of preparing such recommended standard welded connections as may be advisable and they will be published from time to time.

Through these developments it is hoped that eventually it will be possible for the American Institute of Steel Construction to develop design data for welded building construction parallel to that for riveted work given in its "Manual of Steel Construction".

F. H. FRANKLAND
Director of Engineering
American Institute of Steel Construction
New York, N. Y.

Mahoning Creek Dam Design

Sir: In *ENR*, July 10, 1941, p. 11, a picture and brief description of Mahoning Creek Dam, Armstrong County, Pa., appeared, and it is stated that "the dam was designed under the general direction of Chas. M. Wellons, under the immediate supervision of William E. Sidney". This statement is incorrect, and the name of A. L. Alin, senior engineer, should be substituted for that of the writer.

The designs of the sliding gate valve, crest gates, gantry cranes, and other mechanical equipment and features were prepared under the immediate supervision of the writer.

W. E. SIDNEY
Senior Engineer, U. S. Engineer Office
Pittsburgh, Pa.

EDITORIALS

VOLUME 127 NUMBER 23

December 4, 1941

Eleven Ways

ELEVEN CONTRACTORS have used at least eleven different schemes to excavate and line the 85 miles of the Delaware Aqueduct. This diversity of operation is a product of the general policy of the builders of the Aqueduct, the Board of Water Supply of the City of New York, to permit each contractor almost unlimited freedom in his scheme of operations. It is a policy that pays dividends. As outlined in an article in this issue reviewing the lining procedures, each contractor met or improved upon his schedule, and each found, for his particular crew and method, that his choice of procedure was satisfactory. What is more important, the advancement of the art of tunnel lining, and tunnel building in general, is probably far greater than it could have been if one method had been selected for the entire length of the line. The organizations that have built the tunnel in record time have had the opportunity to try out their own ideas. They have been enabled to compare their work with that of their neighbors. Best of all, their spirit of enterprise and ingenuity has been allowed free rein. In this direction lies progress.

Dirt Cheap

WHEN THE BABYLONIANS built their famed city of sun-dried earth blocks they were impelled by the same reasons that caused the settlers of our Southwest, nearly 70 centuries later, to develop adobe houses, and our prairie pioneers of the Midwest to build their shelters out of sod—dirt was cheap and it was the only material locally available. To this day, because of its cheapness and availability, dirt is still on the building material list. It is, moreover, a subject for research now and then, mostly in attempts to combine earth with a binding agent that will make block that will serve as well in rigorous climates as adobe block does in arid regions. The latest experiments, which involve the use of cement as a binding agent, are significant, because not only are they comprehensive and scientific but they contemplate the use of 30,000 soil-cement blocks for a new research laboratory at the University of Kansas. Prof. W. C. McNown, who is in charge of the project, is an able concrete technician, so what he has to say about it on another page of this issue is particularly thought-provoking. If earth blocks can be developed that give strength, durability and insulating value adequate for certain applications, such as farm buildings, for example, a real economic service will have been performed. Other binding agents, such as asphalt and chemicals, are perhaps worth more investigation than they have received.

Low-Cost Homes

ALTHOUGH HOUSE CONSTRUCTION will probably never become a production-line operation comparable to automobile assembly, many ideas developed in connection with mass production industrial methods are finding effective application in the house field. For example, in the construction of the 700-family Rahway River Park (N. J.) project, described elsewhere in this issue, all the lumber was precut, notched and otherwise made ready for installation; then assembly of each house was scheduled as a series of operations, each performed by a group of workmen specially skilled in their particular task. Even more significant is the system being used at Baltimore to provide 600 houses for workers at the Glenn Martin airplane plant. As developed by the John B. Pierce Foundation, this system of construction goes much further than precutting and simple site assembly. It embodies these features, plus the use of factory-prefabricated wall material and plywood girders; and it incorporates a scientific division of labor operations based on time and motion studies. So long as we continue, as in these projects, to strive for more efficient and economical use of both labor and materials, the low-cost housing problem will advance toward solution.

Everything but the Smell

USE OF SLUDGE GAS for operating automotive equipment is not unique, but it assumes a new importance in the light of findings made at Atlanta, Ga. As reported elsewhere in this issue, a study reveals that the city could save $8,000 annually if municipal trucks were converted to operate on compressed gas instead of gasoline. In Germany and Italy, where gasoline prices are much higher than here, no novelty is attached to operating vehicles on sludge gas produced at sewage treatment plants, and the scheme has been found highly practical. In this country we have about 150 installations of stationary engines operating successfully on sludge

gas fuel and, on the basis of the Atlanta figures, our larger municipalities may be tempted to extend its use to motor cars. Already sludge is sold for fertilizer, effluent for industrial water uses and gas for power. As meat packers have long bragged that they utilize everything but the squeal, so sewage disposal engineers may yet be able to claim a use for everything but the smell.

Emergency Road Planning

EVENTS surrounding passage of the emergency highway act last week should be a cause for concern on the part of all interested in sound development of the nation's highway system. The act itself has some undesirable features, and what the President had to say concerning them was deserved. But his remarks went much farther and showed clearly that his opposition to the system under which federal aid to highways has been carried forward during the past two decades is undiminished. It is obvious that he will do all he can to limit further highway appropriations to only such work as is directly connected with the defense effort. Consequently, when it comes to appropriations covering current authorizations, it is important that highway interests develop a constructive program that can gain support in Congress when set over against the President's unreasoned opposition. To permit federal highway expenditures to be cut to actual defense needs would be to let our highways fall into a hopeless state of neglect that in itself would seriously impede our defense effort.

In development of a constructive emergency road program it is important to recognize the defects in the act just signed by the President. Its chief defect is the change it makes in the ratio of federal-state participation from 50-50 to 75-25 for money spent on the strategic network. After all, the roads on which this money is to be spent, except in a few negligible locations, are roads that serve normal highway needs. To use their defense function as an excuse for increased federal aid not only cuts local participation in the cost of what are essentially local services—which is highly undesirable—but also is a step toward complete federal control over federal contributions to state highway work, which appears to be the President's objective in his repeated objections to the present system of apportioning federal aid. A return to the former 50-50 basis is highly desirable.

But the most serious aspect of the controversy with respect to the new bill is the evidence it has brought out that the President is quite unaware of the growing seriousness of highway congestion resulting from our failure to keep up with growing highway needs; and that he fails to recognize that congestion on roads that are not part of the strategic network can slow up our defense effort quite effectively by delaying the delivery of raw materials or products and by reducing the efficiency of the defense workers who must use those highways in their daily travel to their jobs.

The President had logic on his side when he argued that distribution of emergency road funds by the formula used in allocating federal aid in normal times does not result in putting those funds to work where they are most needed to speed our defense effort. Had he been given the unrestricted authorization he asked for, it seems probable that there would not now be the same risk of having federal-aid funds curtailed next year by any one of the ways at the President's disposal.

But that is water over the dam. The important question now is how to keep the current move to cut non-defense expenditures from being carried to the extreme of curtailing work on essential arteries of commerce that must be maintained or rebuilt if both our normal needs and defense needs are not to suffer.

Knowing the President's attitude, common sense would seem to dictate that road authorities in Congress be prepared to resist too drastic cuts in appropriations for work already authorized. When the matter of authorizations for the next biennium comes up after the first of the year, they must be prepared to put forward a program that meets the urgent needs of maintaining an efficient highway transport system without sacrificing the procedure for logical advance programing that is inherent in the present federal-aid set-up.

Work on scenic roads, on parkways primarily for pleasure driving, and on modernization projects that can be postponed without serious detriment to commercial traffic should be postponed until needed in the post-war period. Such a plan would permit the highway industry to do its part in curtailing non-defense expenditures with a minimum of dislocation of highway transport.

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Official Photographs U. S. Navy

Fig. 1. Unusual housing for Navy's airplanes. One hangar is complete and another is approaching that stage.

Navy Builds Concrete Hangars at San Diego

***Contents in Brief**—Thin-shell barrel-type arch structures are built of four independent sections separated by expansion joints. Two-hinged arch ribs on outside of barrel, two to each section, have their footings supported on piles and tied together by bridge strands. Using movable timber forms, a hangar roof section was completed every 2½ to 3 weeks, concrete being supplied by pump line from a mixer on the ground.*

AMONG THE MOST SPECTACULAR of defense-developed buildings are the two reinforced-concrete hangars of thin barrel-shell-roof design built by the Bureau of Yards and Docks at the Naval Operating Base at San Diego. Set side by side so that the adjacent arch hinges have a common footing, the twin structures, in reality, make up a double hangar. Each hangar is composed of four independent roof units, each unit consisting of two arch ribs supporting the thin concrete shell, which cantilevers beyond the ribs to the expansion joints where the shell is thickened slightly at the edges and stiffened by auxiliary ribs. The end units also include an additional arch to help carry the curtain wall that is located over the hangar doors. Along the outside of the hangars there are lean-tos for office space, while the center portion between the hangars, which is partly obstructed by the arch ribs, is arranged for shop space and for the storage of small planes. These principal features of the structures may be visualized by reference to Fig. 1.

The entire building, which is fireproof in itself, is equipped with an open-head deluge system designed to protect the contents of the building and its occupants in case of fire. An interesting innovation in connection with this system is a layout of drainage trenches (two running longitudinally in each hangar) designed with siphons at frequent intervals so that any fire burning on the surface of the water in the trenches will be quickly snuffed out and not carried to other parts of the hangar. The trenches are covered with a galvanized iron grating. Lt. Comdr. H. A. Bolles is the originator of the trench and siphon idea.

The main arch ribs of 294-ft. span and 81-ft. rise, carry the shell at the intrados, with the result that the underside of the roof presents a smooth, unobstructed surface. This design permitted a simplification of the scaffolding and shell forms, so that no extensive rebuilding of forms was necessary in connection with decentering; the forms could merely be lowered a few inches by means of screw jacks, and the scaffolding then rolled ahead to the next section, where the forms could be jacked back into position.

Principles involved in the design and construction of thin concrete barrell shell roofs, as employed on these concrete hangars, have been reviewed in earlier issues of *Engineering News-Record* (May 22, 1941; Oct. 26, 1939; April 8, 1937).

The ribs are designed as two-hinged arches. Soil conditions at the San Diego site being such that solid rock foundations are not to be found at any reasonable depth, it was decided that the vertical arch reaction should be taken on wood piles while the horizontal thrust would be resisted by tension ties composed of $1\frac{9}{16}$-in.-diameter bridge strands. The hinges are of the Mesnager type, to which Rear Admiral Ben Moreell, chief, Bureau of Yards and Docks, has made important design contributions, and serve to center the arch thrust in a predetermined position over the footings. Each hinge is made up of thirty-two $1\frac{1}{4}$-in. vertical bars to take the vertical reaction and twenty 1-in. bars arranged in a fan-like pattern to take the horizontal reaction. An innovation in the design, as used on the San Diego hangars, was the use of high-yield-strength bars at the outside of each hinge as a protection against overturning moments that might be caused by earthquakes. A seismic load of 0.1*g* was included among the other loads for which the hangars were designed.

Construction procedure

All concrete for the footings was mixed at a central plant and transported to the individual footings by

concrete pumps and pipeline. First operation was to pour the floor slabs, to provide a firm foundation for the scaffolding and roof forms that would not be subject to settlement under load. In placing the floor 7-ft.-wide strips were left unpaved at the future locations of the tension ties, and these openings had, of course, to be bridged with shoring when the scaffolding was moved over them. Arch haunches were concreted to the elevation of the lean-to roofs before scaffolding for the main roof and arch ribs was moved into place, as shown in Fig. 2.

The movable arch centering and forms (Fig. 3) for the main roof were designed so that one complete interior roof unit, from expansion joint to expansion joint, could be poured monolithically. The falsework was composed of 6x6-in. posts, braced horizontally and diagonally in all directions by 3x8-in. members, and so arranged that the unit could be divided into four separate parts to aid in moving. On top of this supporting system of posts, trusses, built of 2x12-in. top and bottom chords and 4x6-in. struts and diagonals, were supported on screw jacks, which permitted easy decentering and raising of the forms. Joists of 2x10-in. plank were placed normal to the trusses and a $\frac{5}{8}$-in. plywood decking was installed over the joists. All truss connections were made with $2\frac{1}{2}$-in. split ring timber connectors and $\frac{3}{4}$-in. bolts, while all falsework below the trusses was spiked together.

The entire form and falsework assembly was moved from one position to the next by means of 4-in.-dia. pipe rollers placed on 3-ft. centers under each line of posts. The rollers rolled on 6x12-in. mud sills, which were carefully leveled before the form-moving operation was started. Two 3x14-in. sills on each line of posts transferred the load of the scaffolding from the posts to the rollers.

Motive power for moving the scaffolding was furnished by a small crawler tractor, used in conjunction with a block and tackle arrangement that permitted the forms to move slowly enough to be kept in good alignment at all times. The entire operation of decentering, moving the forms ahead and jacking them into position for the next pour required about one day.

After the forms were centered, reinforcing steel was placed in accordance with the design requirements.

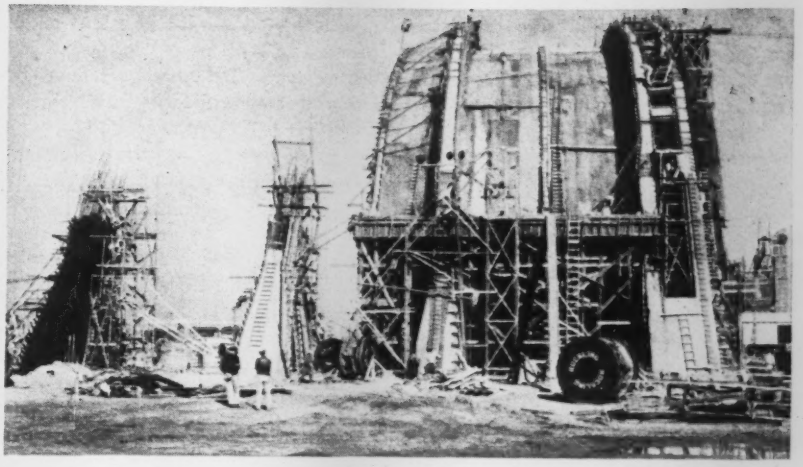


Fig. 2. First section of a hangar concreted. Falsework is still in place and will be moved to next section as soon as the haunches at the left are finished.

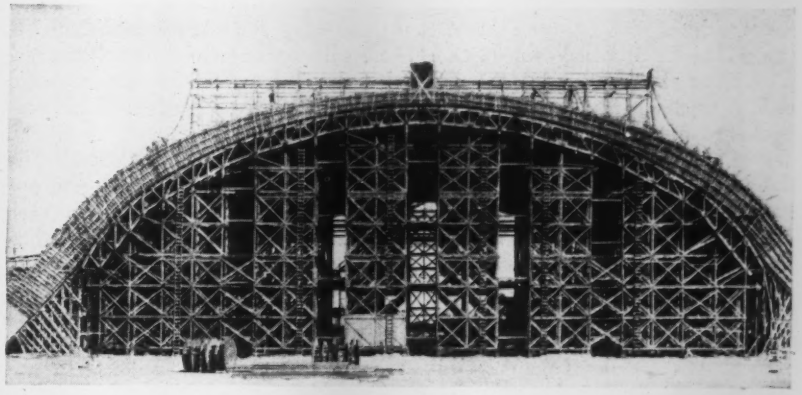


Fig. 3. Falsework and arch rib forms in position for concreting. Concrete was distributed by pipelines supported from the runway on top of the structure.

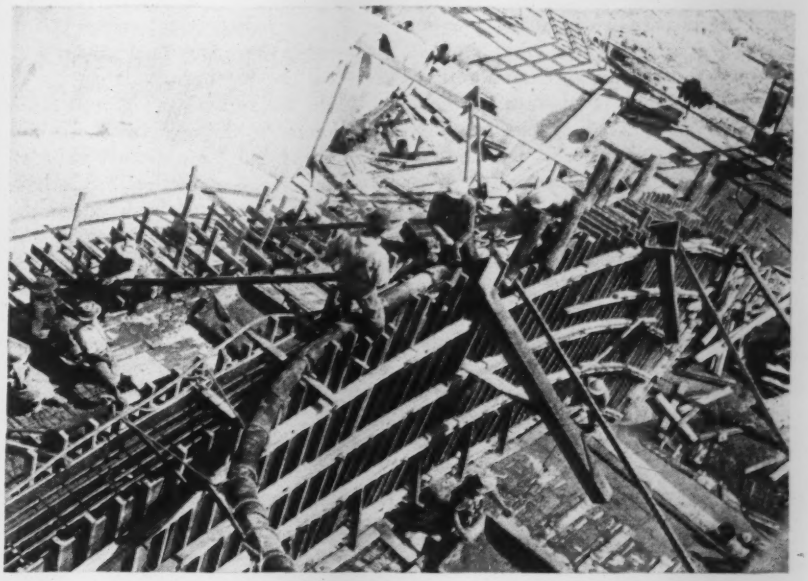


Fig. 4. Metal elephant trunk and auxiliary chutes were used to distribute the concrete that was brought to the top of the hangars by pipelines.

All steel for the shell was lifted to the crown of the arch by means of a small stiffleg derrick. It required about five days to place the steel for each roof pour.

Curvature of the forms was carefully checked by a survey crew before and after placing reinforcing steel. This was a particularly important operation because of the relatively long radius of the shell curvature.

Each roof pour required approximately 700 cu.yd. of concrete, and a method of using concrete pump equipment was evolved that permitted one roof pour to be completed in 14½ hr., which corresponded to an average pouring rate of about 45 cu.yd. per hr.

Two one-yard tower pavers were used to feed the concrete into the pump, which was set up so that it was on the longitudinal center line of the hangar, 100 ft. outside the door arch. A pipeline from the end of each discharge of the double pump was run up to the crown of the barrel and along a longitudinal runway set about 10 ft. above the top of the arch ribs. Then between the two arch ribs that occurred in each pour, a transverse runway (Fig. 3) was extended out about 80 ft. on each side, and one discharge pipe carried out along each branch. At the ends of the cross-runways small divided hoppers were placed, the division plate being so arranged that concrete from the end of the pipeline could be discharged into either or both sides of the hopper. From each side of each hopper a metal elephant trunk was hung, reaching down to the main arch ribs (Figs. 3 and 4), where it discharged into chutes which distributed the concrete onto the shell or into the arch ribs. This arrangement permitted the discharge of concrete to four places at the same time. As concreting progressed, sections were taken off the ends of the transverse pump lines until the crown was reached.

Because of the relatively steep slope of the shell in the lower portions, it was found desirable to use top forms for some distance up the side of the shell. Applied as concreting progressed, these sectional forms were taken off as soon as the concrete had taken enough set to stay on the slope (Fig. 4). The concrete was given a wood float finish.

The time for decentering the arch was controlled by the load-deflection relationship of small test beams made from each roof pour, and was further governed by the requirement of a minimum compressive strength of 2,500 psi. as determined by test cylinders made during the pour. These requirements were usually met at an age of 5 to 6 days.

It was necessary before decentering to jack a stress into the tension ties in order that the horizontal thrust would be taken as the forms were removed. The amount of stress that could be put on the tension ties before decentering was started was governed to a large extent by the footing movements caused by stressing the ties before a vertical load was applied to the footing. This movement was carefully checked by means of micrometer gages. After the footings had been pulled inward slightly, the form jacks were slacked off enough to return the footings to their original position. The operation was repeated until the forms were free of the concrete roof.

An interesting incident occurred in connection with this operation at one time when the forms had not been decentered and the tension ties had been partly stressed, so that the footings indicated a pull-in of 0.012 in. During the night a very mild earthquake occurred. The next morning, on checking the micrometers, it was found that they now indicated a 0.050-in. pull-in. It was decided that the quake had been sufficient to release the passive soil pressure against the inside face of the footing with the result that it had been further pulled in because there was then no vertical load on the footing.

When the forms were moved from one hangar to the next they were not dismantled but were simply skidded in a transverse direction, after having been moved out from under the last section of the first hangar. The last section of roof was decentered 5½ months after the first roof pour was started. Roof pours were, therefore, made on the average of one every 21 days, with the use of one set of forms.

Personnel

The hangars were constructed for the Bureau of Yards and Docks, Rear Admiral Ben Moreell, (CEC) USN, chief and Capt. Edward L. Marshall, (CEC) USN, head of the aviation facilities division. The work was done in the Eleventh Naval District under the direction of Capt. J. T. Mathews, (CEC) USN, public works officer and officer-in-charge. Many valuable features of design and construction were contributed by Lt. Comdr. H. A. Bolles, (CEC) USN, the resident officer-in-charge and Lt. M. R. Montgomery, (CEC) USNR, who were in direct charge of the work. The contractor was the Golden and Trepte Construction Co., San Diego. S. F. Nielsen, project manager, and J. M. Tomlinson, superintendent.

The hangars were designed by the Roberts and Schaefer Co., consulting engineers, Chicago, under license from Structural Shell Designers, Inc., Chicago. Joe H. Lapish, Washington, D. C., was the associated architect.

Seven Cities Plan Joint Sewage Facilities

Seven neighboring California cities on the east side of San Francisco Bay have just completed a joint survey of their sewage disposal problem, which resulted in recommendation that the East Bay Municipal Utility District, now supplying their water, also construct and operate sewage disposal facilities for their common use.

The cooperative survey was an outgrowth of the custom of municipal officials of the seven cities—Berkeley, Alameda, Oakland, Emeryville, Albany, Piedmont and Richmond—to meet for discussion of mutual problems involving the area, according to the International City Managers' Association.

The consulting engineer board, consisting of Chas. G. Hyde, Harold F. Gray and A. M. Rawn, advised the cooperating officials to have a survey made and to appoint one city as agent for the others in conducting it. An executive committee composed of the city managers of four of the cities and council representatives of the other three, supervised the survey, authorizing the city of Berkeley to employ and compensate personnel.

Cost of the survey—$48,000—was divided according to population, land area and industrial concentration of the seven cities. Their contributions were placed in a trust fund which, along with other survey functions, was handled by Berkeley. The survey recommended that 40-year serial bonds be issued to defray the cost of building treatment and disposal facilities, estimated at $8,450,000.

Fig. 1. New boulevard extension as seen from Kanawha City Bridge.

Kanawha Boulevard at Charleston Extended

William Brewster
Senior Highway Engineer, Public Roads Administration
Charleston, W. Va.

***Contents in Brief**—By the extension of Kanawha Boulevard upstream along the Kanawha River at Charleston, W. Va., two dangerous grade crossings have been eliminated on U. S. Highway 60. On the new route an 18-ft.-wide bituminous surfaced roadway on a crooked alignment is replaced by two 22-ft. roadways separated by a 3-ft.-wide mall. For the new highway an earth and rock embankment was placed along the river bank with a rock toe wall built up to 2 ft. above normal pool level.*

To RELIEVE traffic congestion due to narrow streets, the City of Charleston, W. Va., in 1940, completed construction of an express route along the bank of Kanawha River through the city's entire length (*ENR*, March 13, 1941, p. 414). The 4.8-mile express way, known as Kanawha Boulevard, consists of two 27-ft. roadways separated by a 6-ft. division island. This last summer the boulevard was extended slightly more than a mile upstream from the city's eastern limits to provide a better route for traffic on U. S. Highway 60.

Before this latter project, which has just recently been completed, was started, Route 60 traffic used an 18-ft. wide bituminous surfaced roadway on a winding to crooked alignment with a very bad connection to Washington St., the street by which Route 60 is carried through the City of Charleston. Also, traffic along the old route encountered two dangerous grade crossings over the New York Central R.R., which the new highway parallels. One grade crossing is within the city near the Washington St. intersection and the other is about one mile east of the city line (See Fig. 2). Furthermore, there was no connection between route 60 and the end of Kanawha Boulevard at the easterly city line. To correct these conditions, federal-aid projects costing $300,000 in all were planned to connect Washington St. with Kanawha Boulevard and to extend the boulevard 1.05 miles up the valley between the river and the railroad.

Bottleneck also eliminated

In addition to eliminating the two grade crossings and providing an excellent connection with Washington St., the extension also eliminates a traffic bottleneck at the junction of U. S. 60 and U. S. 119 on Washington St. The alignment and grades on the new highway are excellent, since the maximum degree of curve is 1 deg. 12 min. and the maximum grade 0.53 percent.

Due to insufficient width between the railroad right-of-way and the Kanawha River to accommodate the new road (see Fig. 2), it was decided

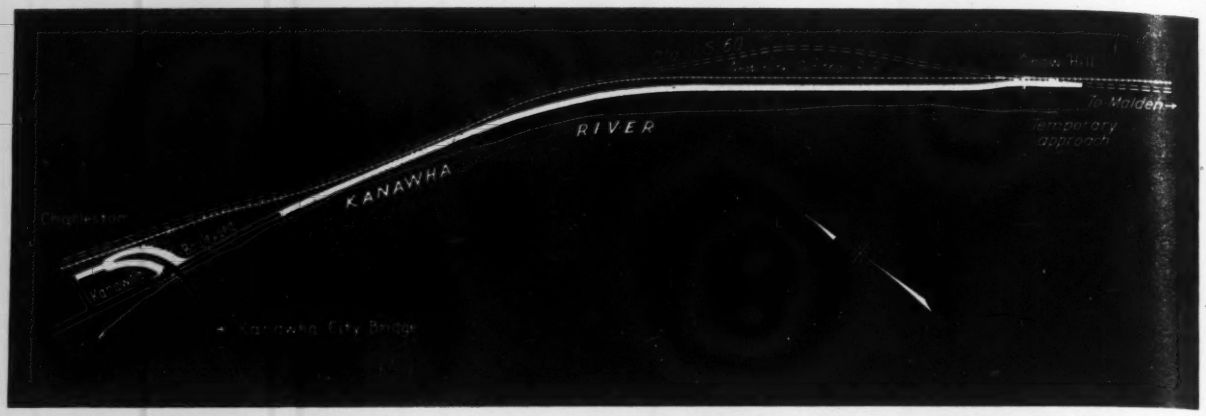


Fig. 2. Extent and location of new work is shown by heavy black line. Note locations of railway and old U. S. 60.

to get the necessary width for a dual-lane highway by filling in at the river's edge with an embankment varying in width from 25 to 50 ft. The design for this fill was given much study, because observation and experience with older embankments built along the edges of large West Virginia streams revealed almost continual subsidence and movement due to unstable conditions of the foundation soil. In several instances, such movement has resulted in complete destruction of rigid-type pavements.

In order to overcome these conditions, it was decided first to cut down to bedrock at the fill's toe a trench with a minimum width of 25 ft. This trench was excavated with a dredge boat and then filled with select, hard, durable sandstone rock to an elevation of 2 ft. above normal pool stage. Rock was obtained from a sandstone cliff near the middle of the project and just across the railroad tracks and the old highway.

After the toe wall was completed to the desired elevation, the area between the wall and the railway right-of-way was filled with rock in 2-ft. layers. This work started near the middle of the job and advanced both ways. Each layer was chocked with rock spalls and fine sandy shale until all large voids appeared filled. In addition, an inch or two of surplus fine material obtained from the part of the job where grading was necessary, was placed on top of each rock layer to insure the maximum possible filling of the remaining voids. It was found on this part of the construction that vibration from the steel-track bulldozers, which spread the fill material, and steel-track hauling equipment was a very effective way for compacting the fill and for filling the voids in the rock layers. Two-ton rollers were also used for this work.

A very dense embankment resulted, and this type of fill was carried within 2 ft. of finished grade. Then a select earth or granular material was used for completion of the embankment, as shown in the accompanying illustration of a typical fill section. The grading quantities required for the 1.05-mile improvement included: rock borrow, 173,550 cu.yd.; earth borrow, 25,000 cu.yd.; and unclassified roadway excavation, 29,200 cu.yd.

The unit bid price on rock borrow was 95c. per cu.yd., including an average haul of 3,300 ft. or a total of 3,000,000 station-yards of overhaul. The unit price for the earth borrow for fill was 30c., while that for the unclassified excavation was 42c.

The grading and fill work provides a 58½-ft. total roadway width throughout the project. This is made up of two 22-ft.-wide roadways of 6.7-in.-thick reinforced concrete, curbs integral with the pavement, a 3-ft.-wide median strip, integral curbs, and one sidewalk. Curb construction and other roadway details are given by an accompanying illustration. In all 28,940 sq.yd. of concrete was required for the paving work, which was done by usual paving methods, and this material costs $1.95 per sq.yd.

Washington St. connection

A connection between Washington St. and the boulevard has been provided by building a 20-ft.-wide, one-way concrete roadway each side of the northern approach to the Kanawha City Bridge, under which the

Fig. 3. Typical cross-section of new highway. Rock toe of fill was carried 2 ft. above normal pool of Kanawha River.

Fig. 4. Here the rock toe wall has been completed and the space between wall and railroad right-of-way is being filled. Maximum height of fill is 50 ft.

Fig. 5. Material for fill between rock toe and railroad right-of-way is supplied by tractor wagons. Fill is spread in 2-ft. layers by bulldozers.

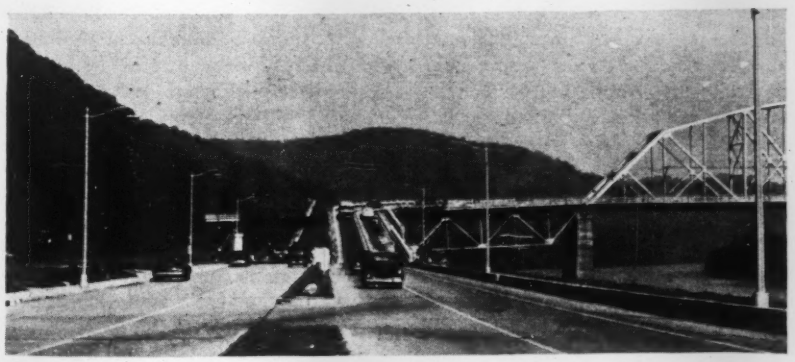


Fig. 6. Upstream view showing portion of Kanawha Boulevard completed in 1940 in foreground, while Kanawha City Bridge is in background with temporary timber approach in service. Note crane installing new girders in the bridge approach to make possible extension of boulevard on past the river crossing.

new road passes. This connection will be used by all trucks, as such vehicles are not allowed on that portion of the boulevard within Charleston.

In order to permit the boulevard to pass under the bridge it was necessary to remove two steel girder spans, one of 60-ft. and one of 30-ft. span, and to replace them with a single 90-ft. steel girder span. Although this involved interruption of traffic over the bridge via the Washington St. approach, continued use of the river crossing by the 14,000 vehicles that daily cross the Kanawha River at that point was made possible by construction of a 480-ft.-long timber ramp. This ramp, built on an 8-percent grade, had divided lanes and extended from the bridge to the south lane of that portion of the boulevard completed in 1940.

The entire highway project was started Dec. 3, 1940, and was completed Oct. 31, 1941. It was carried out by the State Road Commission of West Virginia under the supervision of the Public Roads Administration as three federal-aid projects. Harry Hatfield & Co., Barboursville, W. Va.; T. C. Staples Construction Co., South Charleston, W. Va.; and Pocohontas Construction Co., Lewisburg, W. Va., were the general contractors. For the state road commission, F. W. Kennedy was resident engineer, while the writer, as senior engineer, represented the PRA.

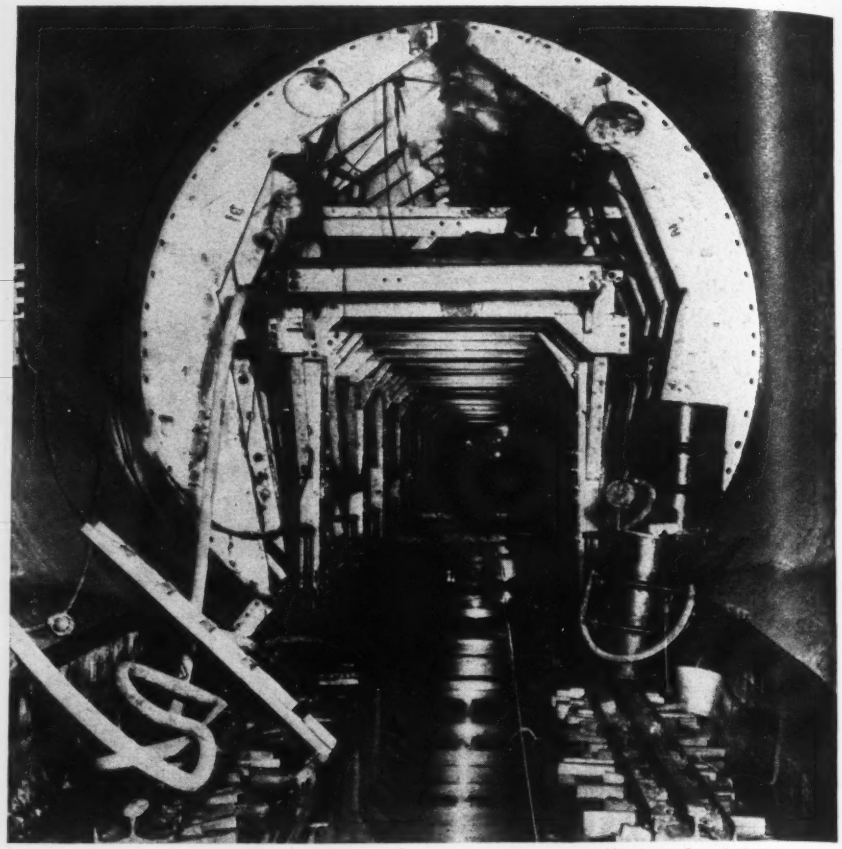
Garbage Grease Nets Profit in Washington

At Washington, D. C., the tidy sum of $65,000 was earned recently from the sale of grease reclaimed from garbage. For many years the city has processed part of its garbage collection in a reduction plant, and the resulting byproduct grease has been stored in lagoons. Taking advantage of a rising market, in the last year of which the price of grease has increased from 3½ to 6½ cents per pound, the city sold 1,000,000 lb. in October.

Meantime the price is still going up (latest quotations on garbage grease are said to be 8¾ cents), and William Xanten, supervisor of city refuse in the District of Columbia, is busy reclaiming grease. He states that each ton of garbage yields about 45 lb. of grease, and that the reduction plant is processing 20,000 tons of garbage yearly.

Lining the World's Longest Tunnel

***Contents in Brief**—Lining 85 miles of tunnel for New York City's Delaware water supply system has assembled on one line the most advanced methods and equipment so far devised for forming and placing concrete tunnel lining. Popular among the contractors have been telescoping forms and continuous pours of concrete, part of which is mixed in the tunnel by double-drum pavers. New in tunnel lining is the long haul of surface-mixed concrete in special agitator cars.*



All photos Board of Water Supply.

Invert concrete is placed last on the Frazier-Davis contract on the Delaware Aqueduct.

FROM YONKERS to the west slope of the Catskills at Lackawack, N. Y., eleven contractors are building 85 miles of deep pressure tunnel to bring an additional half-billion gallons of water daily to the City of New York. Tunnel driving set new records for efficiency and accomplishment (*ENR*, Aug. 29, 1940, p. 288), and now concrete lining is under way with an array of equipment and divergence of schemes probably never equaled on tunneling work.

Contractors and supervisory forces assembled from all parts of the country have brought the most advanced knowledge and equipment to this largest of all tunneling jobs. Invert cleanup with electric bulldozers, blasting out the last of the muck with jets of high-pressure air and water, use of special agitator cars, mixing underground with big pavers, continuous pouring of sidewall and arch, employment of the concrete pump and in one case placing the sidewall and arch ahead of the invert are features of special interest. New to tunneling is use of large agitator cars to haul surface-mixed concrete, dropped down a pipe, to point of placing where the cars discharge direct to the invert or to the pumps or pneumatic placers for arch concrete. The agitator is operated only at point of discharge, and hauls are limited to a maximum of 30 min. from mixing to placing. Power for operation of the agitator comes from the tunnel electric lines.

Thickness of the concrete tunnel lining for the three sizes is shown in the section drawing. "A Line" is the minimum clearance line within which nothing is permitted to project except satisfactorily spaced steel ribs without lagging; the "C Line," generally 5 in. outside of the "A Line," is the line of effective average thickness within which no perishable material other than the absolute minimum of timber posts and blocking outside the steel ribs is permitted to remain; the "'B Line" delimits the rock excavation and concrete to be paid for under normal conditions and is generally 13 in. outside the "A Line."

Concrete for use in the tunnel lining contains 2 bbl. of cement per yd., natural sand for fine aggregate and either gravel or crushed stone for coarse aggregate. The coarse aggregate is supplied in two sizes—passing a $\frac{1}{4}$ to $\frac{3}{4}$-in. and a $\frac{3}{4}$ to $1\frac{1}{2}$-in. mesh sieve, sizes to be combined as immediate use dictates. The large amount of cement used and the small aggregate assures a concrete readily handled by pump or pneumatic gun, and one which flows readily in the forms. Contract requirements include the removal of all roof support consistent with safety, use of metal forms, insertion of pipes for later grouting, and internal vibration in placing concrete.

Eleven contractors hold twelve contracts totaling $156,977,296 for construction of 85.5 miles of tunnel, the individual contracts varying from 5.1 to 14.2 miles (except the contract for Merriman Dam, which includes only 1.5 miles of aqueduct tunnel), in length and $10,000,000 to $21,000,000 in money value, including gate houses and other surface structures.

Tunnels are all circular and in three typical sizes; 13½-ft., 15-ft. and 19½-ft. lined diameter. The tunnel was driven and concrete is being handled from 30 shafts, which are 300 to 1,550 ft. deep.

No two of the contractors use the same construction scheme or sequence of operations. Each of the ideas appears to have been satisfactory for the organization and circumstances that dictated its choice, though some operations have been revised after brief use. All of the contractors use either concrete curb walls outside the "A Line" built accurately to line and grade to align and support their invert forms and other concreting equipment, or use for this purpose rails supported on piers of bagged concrete. Curb walls are commonly built in hand-mucked trenches without removing the muck track but piers are commonly built only after the entire width of the invert has been mucked.

The various lining operations depend so much on the over-all plan that each contract procedure will be described briefly, starting with the work at the New York end of the project.

Shea-Kaiser mix on surface

The concrete for the J. F. Shea Co., Inc., and Henry J. Kaiser Co. contract, for 29,140 ft. of 19½-ft. tunnel is mixed on the surface in a batch and mixer plant located in an enlarged area at the top of one shaft and so situated that trucked-in material can be dumped into the top of the aggregate storage bins. Two 2-yd. front charging mixers discharge into a 10-in. pipe through which concrete drops 375 ft. to the tunnel. At the bottom of the shaft the concrete is cushioned on concrete in an 8-yd. hopper which charges 4-yd. agitator cars, handled two in a train.

Curb walls are not used, pedestals being built up to support rails for a heavy carriage, which has tracks for the agitator cars and carries the invert screed. The concrete for the invert is poured direct from the cars into final position, power for operation of the agitators being supplied by plugging into a power line at time of discharge.

The forms used are collapsible steel sections, which are moved ahead as concreting progresses. Concrete for arch and sidewall is placed from a long carriage that mounts a California switch and a concrete gun assembly with two pneumatic placers. The placers are charged simultaneously and directly from the two agitator cars of the train but discharge alternately to conserve air pressure.

Healy pumps concrete

The S. A. Healy Co. of Chicago is the only outfit on the aqueduct holding two tunnel contracts. One is 26,820 ft. of 19½-ft. tunnel and the other 37,100 ft. of 15-ft. tunnel. Concrete on one was rushed to completion to permit use of the same equipment on the second contract although new forms were required due to difference in size.

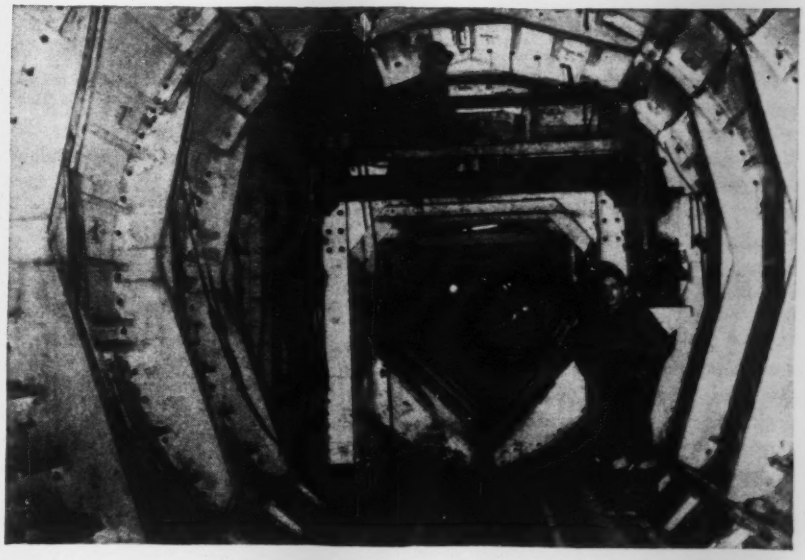
Concrete material is batched in a surface plant, with the various ingredients carried to the bins by bucket elevators. The dry aggregates are dropped through a 10-in. pipe and the cement passes down a 6-in. pipe, each into a separate hopper in the tunnel from which a complete batch (1⅛ or 1¼ yd.) is quickly charged, the cement into a closed container and the aggregate into an open compartment of a transfer car. The cars in use are remodeled 3.5-yd. 24-in.-gage muck cars arranged for end dumping, and are handled 20 to a train.

All concreting operations are conducted in about a 1,000-ft. length of tunnel, progressing away from the shaft through which material is supplied. Concrete is mixed in a double-drum 34-E paver, which has special arms (instead of a skip) for picking up the transfer cars. This mixer feeds directly into a special agitator which supplies concrete to a double cylinder concrete pump.

Curb walls are not used on the Healy contracts, a 130-ft.-long invert form being carried on a steel strip welded to the top of H-beams. The beams are supported on piers made up of bagged concrete put in place while fresh but kept outside of the "A" or minimum excavation line of the tunnel. The side wall and arch forms are of the telescoping type in four 50-ft. units, which permit moving a section ahead through standing forms.

Routine procedure in a 24-hr. cycle of concrete placing may be traced as follows: (1) building 130 ft. of invert rail piers with bagged concrete taken from the invert placing operation; (2) setting invert rails on piers; (3) setting 130 ft. of invert side form and building wood end bulkhead; (4) placing the invert concrete by pumping about 600 ft., adding to pipeline as invert is filled; (5) setting about 125 ft. of arch form with its wooden bulkhead (about 300 ft. behind invert operation); (6) placing arch concrete by pumping; (7) building 125 ft. of timber decking over previously placed invert; (8) moving concrete mixer, pump and switch assembly ahead to keep about 200 ft. behind arch form placing.

The concrete for the arch is



Telescoping forms made the continuous pouring method possible. Here is the form on the Associated contract being brought through erected forms.

pumped to the front end of the form then vertically to the top of the arch and back to the midpoint of the 125-ft. length. When concrete has filled to near the top, pipe is added to the discharge line to carry concrete to the back of the form. As pumping continues two air jets are intermittently used to augment the pump so that the concrete for closing the arch is alternately pumped and blown into place, pipe lengths being removed as the concrete advances.

Associated used truck-mixers

Lining on the contract for 16,030 ft. of 19½-ft. and 18,850 ft. of 15-ft. tunnel held by Associated Contractors, Inc., is complicated by an uptake and downtake shaft, with no connection at the bottom at each of three shaft locations. To reach all of these, and extensive surface work, truck mixers were used, which could be charged at a centrally located plant and the concrete hauled where wanted. The concrete is dropped down 10-in.-dia. pipes, in one case nearly 1,000 ft., to a drop well in a concrete hopper.

Start of the concreting operation is placing a curb wall followed by invert clean-up, using an electric bulldozer and then washing with a combined air and water jet. A movable bridge 350 ft. long rides on rails on the curb walls to support the invert placing equipment and a 36-in.-gage track, which carries 5-yd. agitator cars, two in a train. The agitators are loaded at the shaft and brought over the finished invert to the bridge where they are powered for discharge by plugging into the tunnel power circuit. The two cars are dumped simultaneously through short spouts to the invert. A 10-ft.-long screed is pulled along under the invert bridge by an air hoist, which is also used to move the bridge between pours. Usual pour is 350 ft. in one shift.

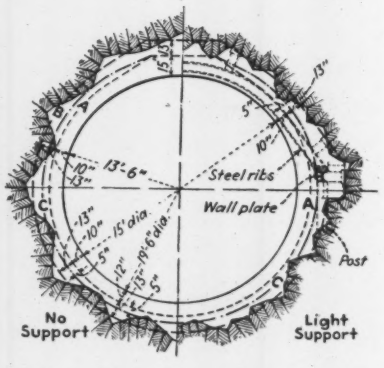
The invert concrete is finished, working away from the source of supply, before the side wall and arch placing is started, working back toward the source. Operations are carried on continuously for a 5-day week. Forms in use are of the telescoping type handled in 20-ft. lengths, a traveler equipped with four hydraulic and four ratchet jacks pulling the form loose, transporting it ahead and setting it in the new position.

Concrete is brought to the forms in the 5-yd. agitators, raised by a "cherry picker" and discharged into a concrete hopper located over pneumatic placers. The pneumatic placers, one in the 15-ft. tunnel and two in the 19½-ft. tunnel, blow into a 6-in. steel pipe extending over the top of the forms. The end of the pipe is kept buried 10 to 15 ft. in the concrete to aid in compaction, and the entire outfit is moved ahead as the concrete advances.

Seaboard handles cement on open belt

Seaboard Construction Corp. has an innovation in their surface plant in a 20 in. troughed conveyor belt which carries cement up a long 16-deg. incline. The cement belt, like the belt of the aggregate conveyors, was covered to protect it from the weather, and it operated without dust or difficulty. Concrete for the 30,600-ft. length of 15-ft. tunnel is mixed in two 2-yd. tilting mixers, dropped through a 10-in. pipe to the tunnel level and hauled by 5-yd. agitators on 36-in. gage cars to point of placement. Curb walls are used and on them a special traveling bridge 400 ft. long carries tracks for the concrete trains. The invert placing operation proceeds away from the shaft, concrete being poured from the agitator cars directly through the bridge.

Sidewall and arch are placed in about 100-ft. advances each day. Forms, not designed to pass through erected sections, are in four sections and are moved on travelers operating on a 7-ft. gage track. Concrete is placed by a pump that is mounted on a traveling bridge, carried on the curb rails. Transfer from the agitator cars to the pump remix hopper is by a short 24-in. belt conveyor. An 8-in. concrete placing line is laid over the arch form and all equipment pulled gradually ahead as concrete fills the form.



Typical section through tunnel on the Delaware Aqueduct.

Utah has paver underground

The Utah Construction Co. place a curb wall, follow it with invert cleaning by a mucker converted to a dragline and then place invert concrete working toward the source of material on their 33,400-ft. section of 15-ft. tunnel. Curb concrete is purchased mixed-in-transit and delivered to the forms by agitator cars operating on the muck track, but for the rest of the concrete material is batched in a plant at the surface and hauled to a point of placing in three 1-yd. batch boxes per car.

Concrete is mixed in a 1-yd. double-drum paver operated on rails set up on piers of bagged concrete after invert cleanup. Transfer of the 1-yd. batch boxes to the mixer is accomplished by picking them up with a special monorail gantry on a rubber-tired frame, which spans the tunnel and travels the curb walls. This gantry is pulled along by the paver and operated by a double-drum hoist located above the mixer.

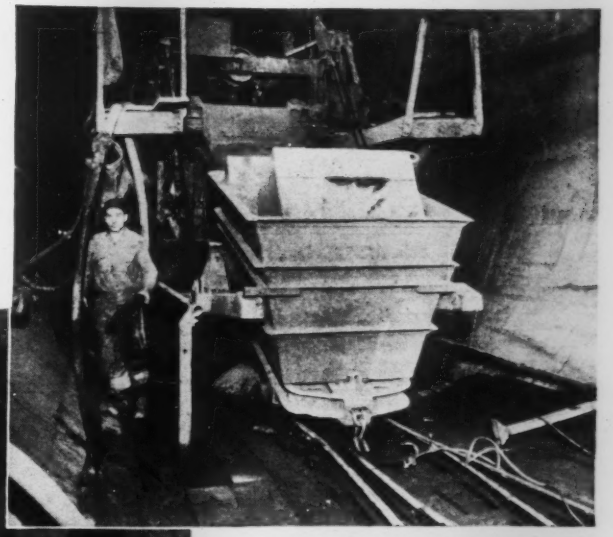
Concrete from the mixer is discharged to a 60-ft.-long belt conveyor, which carries it a sufficient distance from the mixer to give space and time to remove the rails and complete cleaning the bottom. The gantry, paver and discharge belt are moved ahead as a unit by the locomotive on a batch train.

Sidewall and arch concrete is placed continuously for five days a week starting after the entire invert is complete and track laid on it. A total of 288 lin. ft. of telescoping forms is used, handled in 24-ft. sections. Concrete is mixed in the paver and is discharged directly into a pneumatic placer, which takes a full batch of concrete. This is blown into place through a 6-in. pipe, over the top of the form, which is kept embedded from 5 to 12 ft. in the freshly placed concrete.

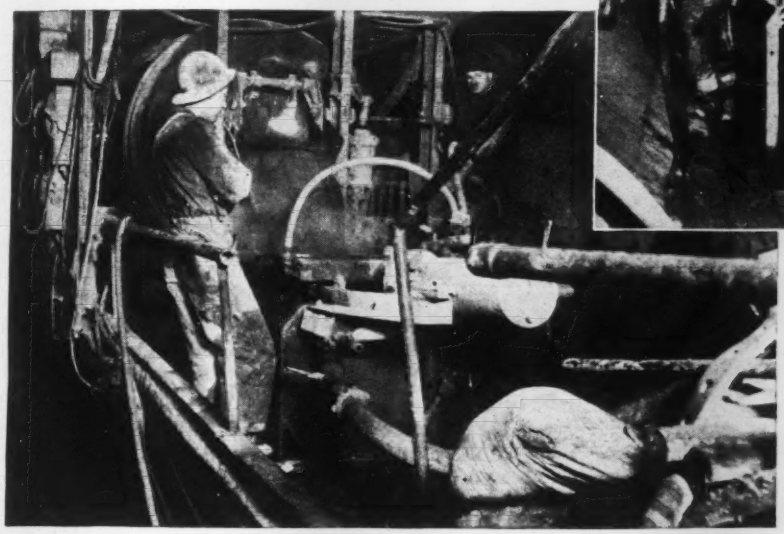
Invert last for Frazier-Davis

Frazier-Davis Construction Co. placed a curb wall first and then the combined sidewall and arch, leaving the invert clean-up and concrete placing until last, this scheme being adopted to simplify the invert cleanup and eliminate relaying track. Concrete is mixed on the surface, in a typical large plant with three 1-yd. non-tilting mixers, which feed onto a

Single-batch cars are lifted to charge paver on Healy contract. Cover picture shows the other end of this equipment.



On Utah's contract a double-drum paver charges a pneumatic placer for shooting to arch forms.



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A Billion Gallons Not Enough...Apr. 11, p. 513, 1940
Routing the Tunnel.....Apr. 25, p. 584, 1940
Designing the Aqueduct.....May 9, p. 656, 1940
Access to the Aqueduct.....June 6, p. 797, 1940
Controlling the Flow.....July 18, p. 109, 1940
Driving 85 Miles of Tunnel.....Aug. 29, p. 288, 1940
Tunnel Haulage and Hoisting...Sept. 26, p. 419, 1940
Reservoirs and Dams.....Nov. 21, p. 688, 1940
Caissons for a Cutoff Wall.....Dec. 5, p. 761, 1940
Treatment for Delaware Water..Dec. 19, p. 822, 1940
Passing Faults on the Aqueduct..July 31, p. 150, 1941
Concrete Core Wall at Merriman Dam .....Sept. 25, p. 426, 1941

belt conveyor for delivery to a 10-in. pipe in the shaft. Curb walls are placed with special 2½-yd. side-dump cars. Arch and invert concrete are hauled in 2-yd. bottom-dump buckets, three to a car in two-car trains.

Forms for arch and sidewall are in five 30-ft. lengths, each set on its own traveler. The form is hinged at the top and can be pulled well away from the wall for moving but is not telescoping. The form traveler is moved on rails set in steel channels on well-leveled blocking just outside the muck track, the traveler serving to support and stabilize the form during concrete placing. The form is moved ahead and set during the graveyard shift and the day shift places the concrete in the 150-ft. length in about 5 or 6 hours. Arch concrete is placed with two ¾-yd. pneumatic guns set up in a long carriage, which operates on the rails laid for the form. This carriage is the frame for carrying the two 6-in. pipes for concrete shooting and also mounts a gantry for transferring concrete from the cars to the pneumatic placers. Loaded buckets are run under the gantry, picked up and moved sideways to a point over the gun and dumped into a 4-yd. hopper equipped with a screw agitator, which keeps a constant supply of concrete ready for the gun. The entire carriage frame moves toward the shaft as placing proceeds.

An electric bulldozer pushes the muck up to a loader and washing completes a 165-ft. section of invert for placing each day. A rail, made of a standard angle, is set on each side wall near the bottom to provide a track for a transfer gantry, a carriage for a 165-ft. belt conveyor and, subsequently, for the invert screed. The gantry in this case picks up the buckets of concrete and carries them ahead over the muck track to a concrete hopper set on the centerline of tunnel, equipped with a screw agitator which feeds the concrete to the belt conveyor for delivery to the invert.

Dravo pumps to invert

Dravo Corporation is mixing on the surface and hauling wet concrete underground for the part of their 55,900 ft. length of 15-ft.-dia. tunnel, which can be reached within permissible time between mixing and placing. Paver type mixers are used near point of placement for the long-haul concrete. Heavy grades away from two of the shafts slow the hauling though diesel locomotives help to combat this disadvantage.

Curb walls are not used but rails to support a 400-ft. invert bridge are carried on bagged concrete piers capped accurately to grade. Five-yard agitator cars, two in a train with dumping ends turned together, discharge on a belt conveyor, which feeds into the remix hopper of a concrete pump that forces concrete out over the bridge. Pipe sections are added to the pump line as the invert fills and some concrete is taken at point of discharge for building piers ahead. This concrete is handled in cars operating on the invert bridge and dumping over its end into other cars operating on an 18-in.-gage track laid on the cleaned invert. The invert is completed working away from the shaft, before the other work is started.

Sidewall and arch concrete is placed the same way except that the concrete is conveyed from transfer cars to pneumatic placers which blow the concrete to place behind telescoping steel forms. This operation is continuous, working toward the shaft,

A 5-yd. agitator car has just discharged its load to the invert of the tunnel on the Associated contract. The men in the foreground are working on a heavy steel screed, which is being pulled forward. The usual invert pour is 350 ft., which is the length of the movable bridge.

and using 420 ft. of forms moved ahead and reset in 30-ft. lengths.

Where underground mixing is employed a 34-E paver discharges directly to the concrete pump on invert work and to the pneumatic placers on arch concreting.

Dravo is crushing stone for coarse aggregate at each of their two shafts and are producing sand at a pit in the area. Hauling conditions to one shaft are poor so they drilled a 12-in. vertical hole from the surface, 476 ft. down to the tunnel line midway between the shafts, to drop sand for underground hauling. The sand is hauled about two miles on the surface to a processing plant above the downhole and after screening and washing, goes down through a 10-in.-dia. pipe grouted into the drilled hole. It is carried by muck cars to Shaft 8 where it is raised to the surface and stocked until needed for concrete.

Pleasantville uses pneumatic placers

Pleasantville Constructors, Inc., mix their concrete underground and use pneumatic placers for both invert and arch concrete on their 36,600 ft. of 13½-ft. tunnel.

The invert concreting operation has a long assembly of machinery fed with dry-batched material, two boxes on a tunnel car. The line is made up of (1) a California switch ending in a single track with a turntable at its head, (2) a 34-E double-drum paver with special arms for pick-up of batch boxes, (3) a pneumatic placer fed direct from the mixer and blowing concrete about 50 ft. to (4) two bottom-dump cars operating on a 450-ft.-long double-track concreting bridge. The concrete is blown to either of two 5-yd. transfer cars, each permanently on one of the double tracks on the bridge. The shooting line is swung to fill the cars alternately; the cars are hauled out on the bridge by an electric locomotive and dumped through the bridge to the invert. Another locomotive is kept on the concrete bridge, being charged while the one is working, and each of them using an offset hitch to pull cars on the opposite track. Forms are handed up on the rear of the bridge and dragged ahead by the locomotive for resetting as concrete progresses. More than 3,300 lin. ft. of invert have been placed in a 5-day week.

A belt conveyor scheme for alternately cleaning invert and placing invert concrete was abandoned after use in one heading.

Mixing of concrete for side wall and arch follows the above procedure but placing is done by a pneumatic gun charged with concrete directly from the mixer. In one heading a belt conveyor filled a 4-yd. hopper above the placer. Concrete is placed continuously through a 5-day week using 390 ft. of telescopic forms, which are moved in 30-ft. lengths.

Walsh uses pump and gun

Walsh Construction Co. mixes underground on their 48,100 ft. of 13½-ft. tunnel. Invert concrete is placed with a pump, and arch concrete with a pneumatic gun. Batching is done in a plant at the shaft top with materials dropped separately into compartments of batch boxes handled two on a car in six car trains. Curb wall construction is followed by invert clean-up with a dragline.

Concrete is mixed in a 34-E double-drum paver charged by a monorail on a gantry, which is supported on the curb wall. The monorail carrier is powered by air from the tunnel supply line and is controlled by an operator riding the machine. Bottom-dump batch buckets discharge into a mixer loading skip. Mixed concrete is discharged into a remix hopper, which feeds a concrete pump that places the invert. A traveler 530 ft. long bridges the curb walls and carries the pipeline and the tugger hoist for hauling the invert screed. The screed moves on the radial invert side forms attached to the curb walls. Concrete is placed progressively away from the mixing and pumping unit by adding pipe, a day's run of concrete being limited to the length of the bridge. Rail is laid on the completed invert to move the mixer unit.

Sidewall and arch concrete progress toward the shaft with the charging gantry on the curb wall and the mixer unit on the track on the invert. Here, however, instead of using the pump for placing, a belt conveyor carries the concrete to a 3-yd. hopper over a pneumatic placer, which shoots a 1-yd. batch through a 6-in. line over the arch forms. Forms consist of seventeen 20-ft. units, which can be telescoped and moved ahead through erected forms. Concreting was continuous over a 6-day week, reduced now to 5 days to permit overhaul and clean-up on Saturday. The shooting line is fixed length and the entire placing assembly moves forward slowly as the form fills.

Rosoff hauls with diesels

Samuel R. Rosoff, Ltd., has 75,100 ft. of 13½-ft. tunnel under the Shawangunk Mountains. Concreting follows the usual curb wall, invert and side wall-arch scheme with concrete mixed on the surface in three 1-yd. non-tilt-

ing mixers and dropped through a 12-in.-dia. pipe (1,500 ft. at Shaft 2A) then hauled by agitator cars.

Invert concrete is placed working away from the shaft. A 1200-ft. length of bridge, which rides on the curb walls and has a California switch then a long single track down the center, permits dumping direct from the agitator cars to the invert. Invert is concreted in a different heading from that in which the arch placing is carried on. Concrete is placed on the evening and graveyard shifts of Wednesday and Saturday nights. This schedule allows three days for moving the bridge and form and preparation of the invert, thus interfering only a small amount with continuous placing of the arch. Concrete is hauled in 4-car trains by 3 diesel locomotives and handled on the bridge by a battery locomotive to keep the diesels on the long hauls.

Arch placing is continuous from Monday at 8 A.M. to Wednesday at 4 P.M. (for two shifts the concrete goes to the invert) and again from Thursday at 8 A.M. to Saturday at 4 P.M. giving 14 shifts on arch concrete and 4 on invert out of a 6-day week. Arch placing progresses toward the shaft with 390 ft. of telescoping forms in use, moved continuously ahead in 30-ft. sections. A long, rather high, carriage operating on the curb walls has two pneumatic placers on opposite sides of a center track and so spaced that each of two of the agitator cars of a 4-car train can discharge directly and simultaneously into the placers. Two 6-in. shooting lines are used over the arch form and the entire placing assembly moves ahead as the arch is filled.

Mason & Hanger have variety

Mason & Hanger Co., Inc., have tunnel sections varying in shape, including horseshoe and special longitudinal flume walls; grade, varying up to 10 percent; and a variety of sizes. Combined length of all sizes is about 10,000 ft. Concrete lining has only recently started on one section of the work but the general procedure will be surface mixing, dropping down the shaft and placing by concrete pump. For part of the work a concrete pump will feed a penumatic gun, which will place the concrete in the forms. In the inclined tunnel the concrete will be carried to the pump by cars lowered by gravity and the empties pulled back up the incline by a cable. On the section of 13½-ft. tunnel leading from Shaft 1 the invert will be concreted first, working away from the shaft in 300-ft. advances. The wall and arch will progress toward the shaft using 125 ft. of non-telescoping forms with concrete placed by pumping.

Typical progress

Sustained rates of progress over periods of 3 to 9 consecutive months, when operating at near the maximum rates and without unusual interruptions and delays, have ranged on the different contracts from about 16,000 to 21,000 yd. per month when lining from one shaft and about 25,000 cu.yd. per month when lining two different sized tunnels from two shafts. The maximum yardages for single months have ranged on the different contracts between 20,000 and 33,000 yd. As between 13½ ft., 15 ft. and 19½ ft., the diameter of the tunnel appears not to be controlling.

Curing of the tunnel concrete has been done largely by spraying the walls with a hose. Some of the contractors have attempted to use atomizing devices to provide moist air in a controlled ventilation system, but have had only nominal success.

Air currents in the tunnels normally vary considerably in direction and velocity so most contractors have been obliged to control them by temporary bulkheads and power-driven, propeller-type fans. Where diesel engines are used for hauling, particular care is taken to keep the exhaust fumes within health department requirements.

The Delaware Aqueduct is being built by the Board of Water Supply of New York City under direction of Charles M. Clark, chief engineer, and Roger W. Armstrong, deputy chief engineer. The field work is handled by department engineers; John M. Fitzgerald on the southern half of the work, Neil Holdredge in the northern area, and James A. Guttridge for Mason & Hanger's tunnels and other work on the watershed area.

Data on contracts, contractors and contractors' personnel appear in *ENR*, Aug. 29, 1940, p. 293.

Welding in Railway Maintenance

VARIED USES and economic results of welding in maintenance work on the railways were noted in a report on welding in railway water service presented at the recent annual meeting of the American Railway Bridge and Building Association, in Chicago. Decided economy in removing old piping and installing or repairing new water supply facilities is effected where the repair men have oxyacetylene welding outfits on their cars.

As an example, the water service department on one railway has its system gang and 11 division gangs equipped with such outfits, while one of the division gangs has also an electric welder for shop work, welding iron castings and thawing frozen service lines. Welding is used almost exclusively in repairing pipelines for air, steam and water distribution in the yards, and for the various pipelines in shops, roundhouses and powerhouses. For new work, bevel-end pipes and fittings are ordered, ready for welding. This does away with many unions, which are often a source of trouble. Reductions, bends, tees, ells and branch connections can be welded in place more satisfactorily and in about half the time required for screw connections. In repairing a leaky joint, a short piece of pipe can be spliced in, making a secure and rigid job.

The system gang uses its oxyacetylene outfit for a variety of purposes, including welding and cutting steel and wrought-iron pipe; brazing and repairing well screens, casings and drop lines, and salvaging and repairing valves and fittings. Welding has reduced the number of fittings required by 66 percent, and is used for all kinds of repair work in iron, aluminum, brass and copper. Conclusions presented with the report were to the effect that welding is now a necessary process in the water service and other departments, and that while gas welding outfits are the more numerous, the use of electric welding can usually be obtained by taking the work to the division shops. But portable electrical welding outfits are being used for thawing frozen pipes and for welding castings in place. The greatest use of welding in water service work is in welding and cutting pipe, melting joints in cast-iron pipe, and in improvising connections.

Earl W. Reinhold photo

Fig. 1. Temporary sawmill used at the Rahway River Park (N. J.) defense housing job.

Pre-Cut Lumber Speeds Defense Housing

***Contents in Brief**—A schedule calling for the completion of 254 frame houses at the rate of two a day, was made possible by pre-cutting lumber to exact dimensions and using site assembly technique for erection. The temporary sawmill installation for this FWA project near Linden, N. J., handled peak loads of 80,000 b.ft. of dimension-cut lumber daily. Supplementing this staff report are some interesting comments on job progress and fixed-fee work from Contractor Clifford F. MacEvoy.*

USE OF A SAWMILL that pre-cut enough lumber daily for 20 house units was a major factor in expediting construction of a 700-family defense housing project near Linden, N. J. Other factors that contributed to the speedy erection were the development of specialized gangs of workmen for specific tasks and the use of building materials that required a minimum of labor for installation. Examples of the latter were gypsum board exterior sheathing, which was factory-covered with asphalt paper, and oak flooring delivered on the job with a factory-applied wax finish.

The project, known as Rahway River Park, is the third and largest of the FWA housing development to be built under the so-called "Camden Plan" of financing (*ENR*, May 22, 1940, p. 813). In essence, this plan provides for the federal government to furnish initial capital and build housing facilities, which are sold or leased under a rental system to residents, who become stockholders of a "mutual housing corporation." The latter assumes complete control of the enterprise as soon as the federal government has acquired sufficient financial return to protect its equity.

When the Clifford F. MacEvoy Co. of Newark, N. J., received the $2,100,000 cost-plus-fixed-fee contract for the Rahway River Park project, its problem was that of erecting 254 houses of six types on a 125-day schedule. The houses, designed by J. T. Rowland, architect, Jersey City, N. J., are of flat roof, wood frame construction, with cellars having concrete-block walls supported on a concrete slab forming the cellar floor. Asbestos-cement shingles are used on the exterior. All exterior walls and the roof are insulated, and the houses are heated by means of a ductless hot air system, coal-fired.

Use of pre-cut lumber and site-assembly methods of erection were adopted to meet the fast construction schedule. Operations on the 107-acre site, were started on June 23 when power shovels moved in to excavate the cellars. Then followed the pouring of 4-in. concrete floor slabs (thickened out to 8 in. on the sides), and the erection of concrete block walls.

Coincident with the start of foundation operations, work was begun on the installation of a sawmill. Located adjacent to a railroad siding, about a mile from the housing site, the mill included four roller conveyors and saw sheds. As shown in Fig. 2, two of the conveyors were served by two sets of saws each—one for straight sawing and the other for radial cutting—while the other two conveyor lines were provided with three saws, the additional saw of the bench type being used for sizing small lengths of stud material. The number and size of saws employed at the mill are indicated on Fig. 2.

The saws and conveyor lines were spaced at right angles to the railroad track so that cars of lumber could be spotted and unloaded at the closest point of use. Space was provided for the storage of dimension-cut lumber in stockpiles adjacent to the gravity-operated roller conveyors. A tractor tread crane was employed for lifting piles of completed lumber into trucks

for transportation to the building site.

First step in the production of pre-cut material was to make framing, wall and roof sketches for each of the six house-types, showing the position and size of all members. A number and letter designation then was assigned to every member; thus, for a Type 3 house the floor joist was marked "3-J-1" the first number indicating house type, the letter identifying the kind of member and the last number indicating its place on the framing plan. Similar designations were made for studs, rafters, and miscellaneous pieces used in canopies, porches, etc.

Schedules made up at the sawmill provided for the production at one time of large quantities of a single member. Adjustments were made at the saw tables to cut and dado the desired member according to plan dimensions, after which several hundred pieces would be produced. Finished pieces, which passed from the saw shed via the gravity conveyor, were stored in stockpiles; each piece was marked with its number using surveyors' blue keel for this purpose.

Quantity production and flexibility in scheduling were possible with four saw-and-conveyor lines in operation. Peak production through the sawmill as 80,000 b.ft. of lumber daily, with a general average of some 40,000 b.ft. The latter amount represents sufficient material for 20 family units.

From the general layout of the mill, shown in Fig. 2 it will be seen that two of the production lines were used for cutting the 2x8-in. joists and rafters, while the other two lines handled the 2x4-in. stud material. On the latter lines a bench saw was included in addition to the straight cut and dado saws. This bench saw was used for cutting smaller pieces of studding into suitable stock for canopy and cornice construction.

Site assembly methods

After completion of the foundation and cellar walls of a house, the erection schedule devised by Frederick Rabbe, superintendent for the MacEvoy Company, proceeds as follows:

A truckload of the required number of pieces of pre-cut lumber for framing and covering the first floor is dispatched from stockpiles or taken off the conveyor lines of the sawmill. The framing operations are carried out by a gang of carpenters who specialize in nothing else but this operation. Provided with a copy of the sketch plan used at the sawmill, this gang assembles the joists according to the plan designation; within a short time the men become familiar enough with the numbers and position of various pieces to dispense with the use of the plan.

The second operation in the assembly involves the erection of side walls. This is done by another gang of carpenters using pre-cut material selected from stockpiles at the sawmill and delivered by truck in the exact quantity and sizes required. As shown in Fig. 4 the side walls are assembled in a flat position, covered with gypsum board sheathing and then raised and fastened in a vertical position. The gypsum board used in this project, which comes in standard 2x8-ft. sheets, is covered on both sides with a factory-applied tar paper. Use of this product eliminates separate application of weatherproof paper before the exterior is shingled.

Interior partitions are similarly installed by a third gang of specialists in this operation, and a fourth gang then goes to work on the roof framing.

Other operations, which follow in order, include: plumbing and wiring, side wall exterior shingling and roofing, placing of insulation, installation of gypsum interior wallboard, trimming and laying of the finished floor. The latter is ½-in. tongue-and-groove oak stock, which is delivered from the factory with a multi-layer polished wax finish. After it is nailed into place, the floor requires no further finishing.

Some sidelights

Street, sewer, water and gas facilities on the Rahway River Park project, estimated to cost $794,500, are being installed by the Work Projects Administration under the direction of George Malley, chief engineer of the New Jersey State WPA organization.

The 107-acre project site was acquired by the Federal Works Agency following passage of a special Act of the New Jersey State Legislature creating the township of Winfield.

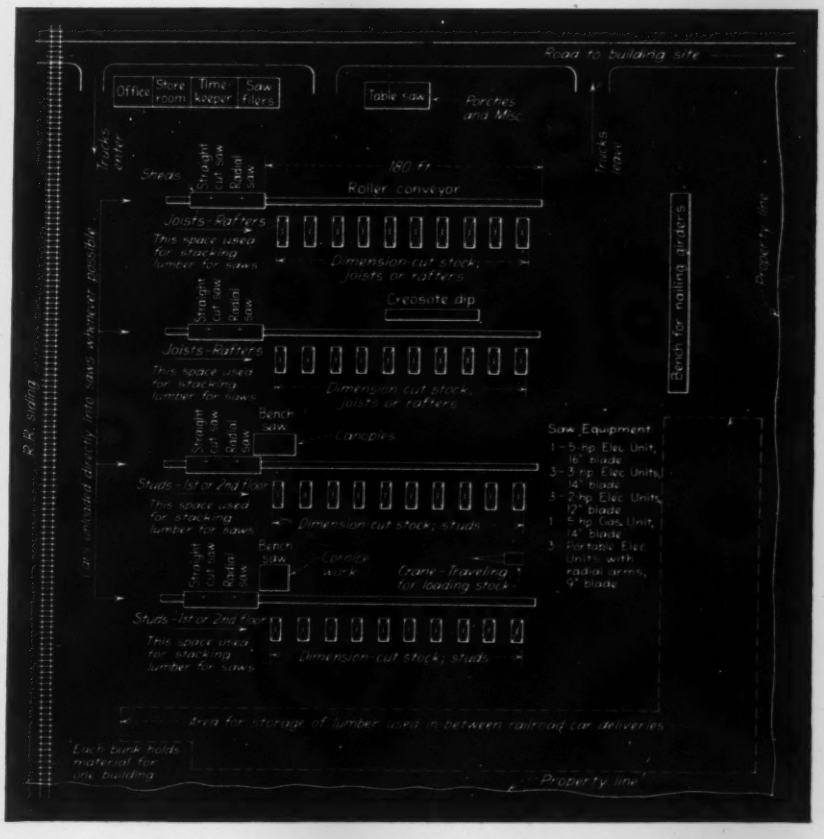


Fig. 2. Layout of the sawmill with its four production lines furnishing dimension-cut lumber. Lumber is delivered direct by rail, cut to size, conveyed to stockpiles and then carried by truck to the housing site as needed.

This was done because the two communities in which the site is situated protested against locating a housing development of such size within their boundaries. As a result, the 700-family community, which will be established when the houses are completed, will be the only township in this country under federal control.

This project is one of the defense housing developments under the personal direction of Lawrence Westbrook, special assistant to the Federal Works Administrator John M. Carmody. Field operations are being carried out under the direction of Arthur E. Sankey, FWA project manager, assisted by O. B. Blizzard.

Comments by The Contractor

Clifford F. MacEvoy
President, Clifford F. MacEvoy Co.
Newark, N. J.

Editor's Note: After Mr. MacEvoy reviewed the foregoing article describing the Rahway River Park project, he returned the manuscript with a letter of comment. We publish this letter because his observations are believed to be of interest to many readers, especially contractors.

THE DISPOSITION to regard every government operation as slow, disproportionate in costs and lacking orderly direction is so general that we take special pride and satisfaction in the results that have been attained on the Rahway River Park project. And in our opinion the special housing division of the federal works agency under Col. Lawrence Westbrook is to be credited with an exceptionally well conceived and executed housing operation.

In 1938 we established what we think still stands as a building record, having completed MacEvoy Court in Newark, N. J., a 10-story fireproof apartment with 1,054 finished rooms, in 100 working days (*ENR*, Dec. 15, 1938, p. 759). We had to do better than this on frame houses to keep within the limit of 125 calendar days allotted for the Rahway River Park, but it was not expected that we would reach and maintain a pace of 39½ finished rooms per day for 80 working days, thus completing the building schedule by Oct. 25, at least 20 working days ahead of schedule.

It was expected that we would not exceed the cost limitation of $3,000 per family unit. It was not anticipated that we could build for less than the allotted sum. However, excavation, concrete and masonry items have been finished at less than the estimated cost. Careful costs have been kept on carpentry, the last major item remaining unfinished, and these justify the present expectation that the cost of the entire project will be 5 to 7.5 percent less than the limit fixed in our contract.

Work has been expedited and costs kept low through the close cooperation of architects, supervising authorities, and contractor forces, which working arrangements prevail under the fixed fee form of contract. For example: Instead of time being consumed in the preparation of plans, receiving bids, etc., during the period of good weather, work was placed under way immediately. Within one week of the decision as to type and number of buildings to be built, the foundation sizes were determined and excavation started. The finished plan for superstructure was developed as the foundations were being installed. The sawmill was set up and organized during this period so that when plans were received, cutting proceeded at once and the pre-cut house members were delivered and erected on foundations that had been built during the interval.

Only 88 working days will have elapsed from June 27, when completed plans were received, to Oct. 25, when completion is expected. With eight days' allowance for bad weather, only 80 working days have been consumed in building residences for 700 families. We doubt that any speed approximating this could have been made under any other form of contract. What has been accomplished could be duplicated by any competent contracting outfit who had, as we have had, the close assistance and cooperation of skilled, practical, governmental agencies.

Advantages of fee contract

We believe that one does the building industry and the defense building program a service in giving publicity to results such as have been obtained here under a fee contract. Much is heard in general condemnation of having work done other than on a lump sum bid, and little is said of the delays, shoddy workmanship and ultimate direct and indirect cost of some projects which start out by an award to the lowest bidder.

We all know that the responsible bidder hesitates to undertake work

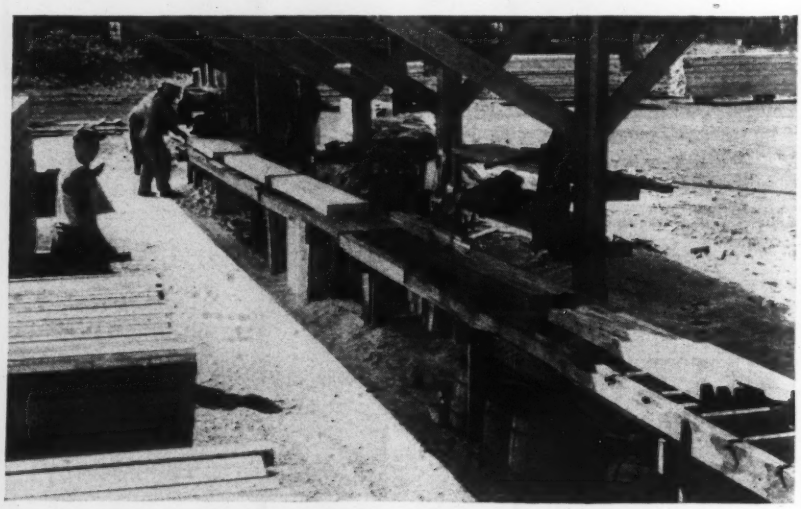


Fig. 3. The "business end" of the production line. Dimension-cut lumber moves from the saws to stockpiles, which were distributed along the 180-ft. length of a roller conveyor.

at a fixed cost which must be completed at top speed, regardless of the unpredictable changes in price and ability to get materials and labor. The same caliber of contractor would, however, undertake the work and be expert in procuring and directing such labor as is available, with such material as can be had, at cost plus a very moderate fee. If the responsible contractor goes into competition at all, under conditions that now prevail in the industry, which are threatening to get worse, he must, as a matter of ordinary prudence, include in his estimate a sum for unforeseen contingencies, which the less cautious contractor does not provide in his bid.

It so often happens that the least desirable contractor bids the lowest sum. Therefore, in urgent defense work where the effort is to get performance, good workmanship and the lowest possible ultimate cost, the lowest guess method would seem, and often proves to be, the worst rather than the best way to make a selection of contractor. This leaves the field almost entirely to the speculator, gambler, and less qualified broker and contractor, and leaves the government with the choice of making the best of a bad deal in getting completion of such work, or resorting to the legal delays and uncertainties of utilizing the procedure of bonding company completion.

To the foregoing observations, I would add the following thought on the importance of our pre-cutting job sawmill (which operation, by the way, was inspired by Colonel Westbrook's previous experience with house prefabrication) in producing the low cost and speed of our operations: In the competition for men where time as an important factor and a large force is needed, it is difficult to procure and maintain even a normal percentage of highly skilled workers. Good house construction requires exact cutting and close fits. This result, if obtained at all by run-of-the-mill carpenters, is slow and expensive. Both of these problems are solved and a highly satisfactory result is obtained where every timber is cut to exact length in the pre-cutting mill, leaving only an assembly and erection operation that requires a minimum of time and skill on the building site.

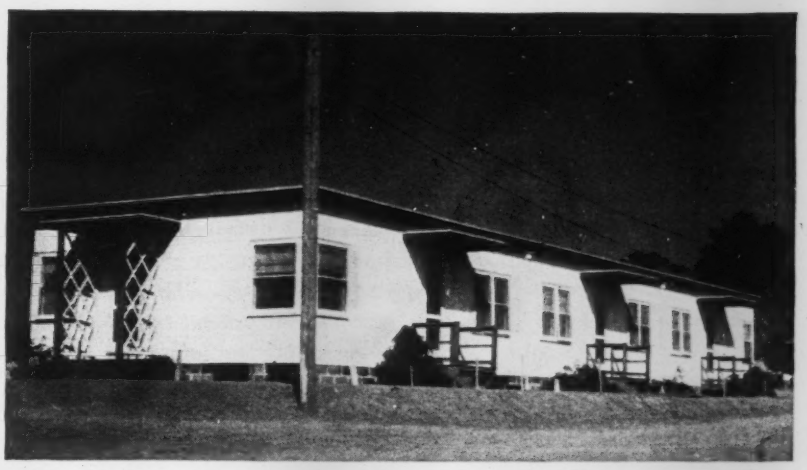


Fig. 5. Exhibit homes of one type were quickly completed at Rahway River Park, and they attracted thousands of visitors while the project was under construction.

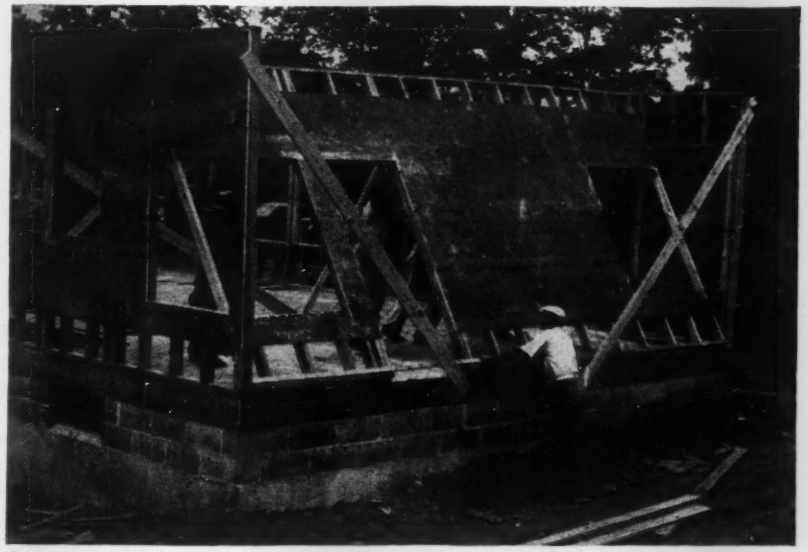


Fig. 4. Assembly of pre-cut lumber on the site speeds the erection of houses. Sides of the house are framed flat on the floor, covered with gypsum wallboard and then raised into position.

Demountable Houses Moved for $500

DEMOUNTABLE prefabricated houses can be taken down, moved to a new location and reassembled at a cost of about $500, according to preliminary data on tests made at the Indianhead, Md., "pre-fab lab" where about 600 houses built by ten fabricators are nearing completion. Demountability and re-erection tests by eight of the contractors showed costs ranging from a low of $395 to a high of $762; five had costs under $465.

The test consisted of taking down a completed house, loading it on a truck for a 30-mile journey over rough roads, and erecting it at a new location for immediate occupancy. Costs included labor, truck hire and all materials needed to replace damaged or unsalvageable parts, such as foundation piers and brick chimneys.

According to Allan W. Stephens, consulting engineer of the FWA division of defense housing, these tests amply demonstrate the economic soundness of the demountability feature incorporated in prefabricated houses built for defense needs. When the emergency is over and houses are no longer required at their present sites, it is proposed to move them.

At the present time 6,577 demountable prefabricated house units are either completed or in the process of construction.

Sludge Gas for Motor Fuel

***Contents in Brief**—A truck that travels 3½ miles on a gallon of gasoline could go 8½ miles on a cylinder of compressed sludge gas, according to a report made to Atlanta, Ga., relating to the utilization of excess digester gas. By converting all the city motor equipment for operation by sludge gas an annual saving of $8,000 would be possible. At present the city is generating power from the gas and using the excess for fuel in heating boilers at a water pumping plant.*

EXCESS SLUDGE GAS formerly wasted at an Atlanta, Ga., sewage treatment plant is now being used as fuel for heating boilers at the city's water pumping plant and thus is expected to yield a $6,400 annual saving. Additional studies reveal, however, that the gas could be used to operate all the city's motor truck equipment at a net profit of $8,000 annually, according to a report made for the Atlanta municipal authorities under the direction of Dr. Harold Bunger, director of the State Engineering Experiment Station, Georgia School of Technology.

Digestion of sludge at the 42-mgd. Clayton plant (largest of Atlanta's four treatment plants; see *ENR*, May 26, 1938, p. 741) produces enough gas to generate power for all plant requirements and leave an excess of 160,000 cu.ft. daily. The only disposition for this excess gas was to waste burners. Because the gas, with its 70-percent methane content, has a heat value of 650 B.t.u.'s per cubic foot, a study was initiated to seek further uses.

In reaching a conclusion as to the most economical use of the excess gas, one of the controlling factors was that the gas compression and bottling processes required for its conversion into motor fuel would be an entirely new activity for the city, and the amount of available gas was too small to make it a reasonable business venture. Further, under present conditions, it would be impossible to secure the steel storage bottles for use on the trucks, and it is doubtful if other needed equipment could be obtained. In employing gas for fuel under boilers, however, the change-over is a relatively simple and inexpensive operation. It was decided, therefore, to pipe the gas to the pumping station for use as fuel.

Boiler fuel use

Use of the sludge gas for boiler fuel is accomplished as follows, says the report:

The raw gas, without being purified, is piped to the pumping station, which is less than one-half mile away, and burned under one of the boilers generating steam, thereby replacing some coal. The total investment involved in making this change was less than $4,400, and operating costs are negligible. Therefore, the only annual cost is the fixed charges, amounting to about $660. Coal to provide equivalent heat would cost $7,000. Accordingly, a net saving of $6,400 per year should be realized.

Motor fuel possibilities

In analyzing the use of sludge gas as a motor fuel, the report points out that the raw gas must be cleaned of

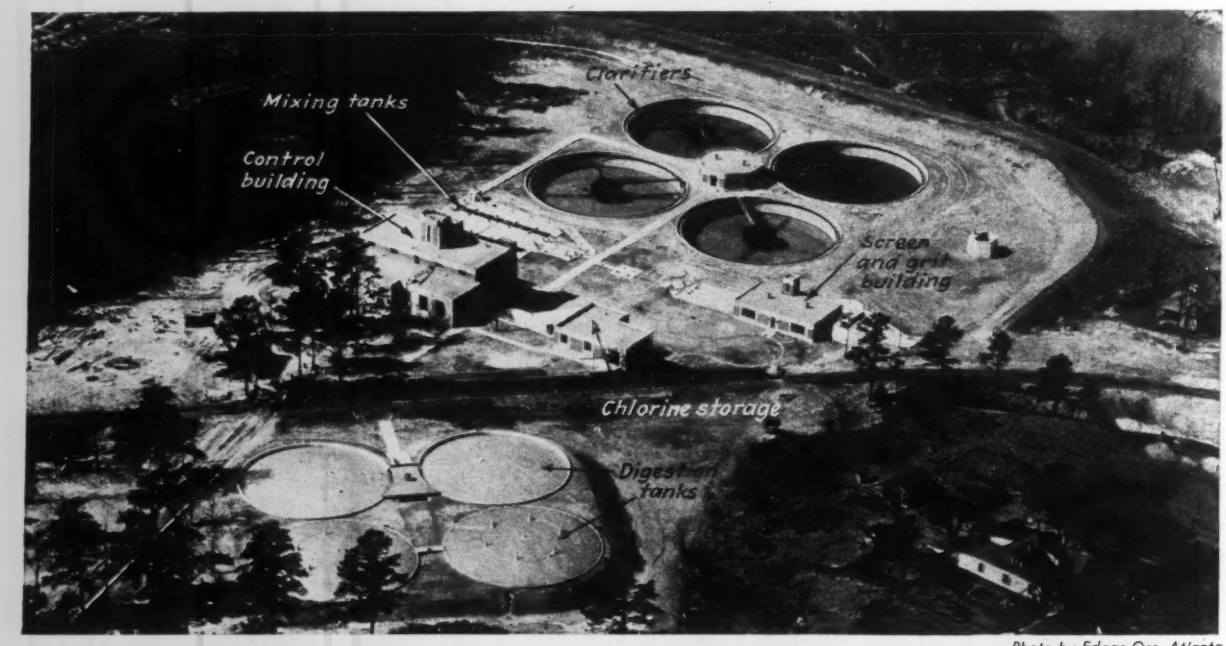


Photo by Edgar Orr, Atlanta

Fig. 1. Clayton sewage disposal works at Atlanta includes sedimentation, optional chemical treatment and two-stage sludge digestion. Gas is produced in the digestion tanks shown in left foreground.

its carbon dioxide content and then compressed to at least 3,000 psi. In the compressed form, it is transferred to cylinders 9 in. in diameter and 5 ft. long, which can be mounted on the sides of garbage collecting trucks. A garbage truck that travels 3.5 miles on a gallon of gasoline could go 8.5 miles on one cylinder of compressed gas.

The fuel gas cylinders must be hauled back and forth between the sewage disposal plant and the incinerator where the garbage trucks are stored. It would not be practicable to transport the compressed gas in large storage cylinders and then fill the small cylinders without removing them from the truck. Fuel cylinder changes would be made at the incinerator.

A recovery process based on the utilization of about one-half the excess sludge gas as fuel for the 60 municipal garbage collecting trucks could be installed for $34,520. The annual fixed charges and the operating costs would total $15,743. The annual value of the gasoline saved would amount to $19,350.

If it were practicable to use the compressed gas as a motor fuel in enough of the other city trucks, so that all the excess sludge gas could be employed, the net saving would probably be around $8,000 annually, according to the report.

Equipment needed

To process the gas for motor fuel, the following equipment would be required:

A four-stage compressor complete with cooling coils, water traps and other accessories; this equipment should have a capacity of compressing 125 cu.ft. of raw sludge gas per minute, to a pressure of 3,200-3,400 psi.

A 100-hp. gas engine, to drive the compressor.

A set of three high-pressure storage tanks, with a total volume of about 8 cu.ft.

High-pressure gas lines and high-pressure charging manifolds, from which the truck cylinders would be charged.

A packed steel tower for the absorption of carbon dioxide from the raw sludge gas. This tower should be 30 ft. high and about 3 ft. in diameter and must be capable of withstanding a pressure of 150 psi.

A high-pressure water pump for pumping and possibly circulating the water used in the absorbing tower. A low-pressure gas meter, control mechanisms and a small shop would also be required.

Fuel production process

Operation of the process for motor fuel production, says the report, is as follows:

Raw sludge gas is metered and conducted to the first stage of the compressor, where its pressure is increased to about 150 psi. After water cooling, the gas is led to the bottom of the absorbing tower where it meets a stream of water coming down the tower. Most of the carbon dioxide in the raw gas is dissolved by the water. The clean gas, which is substantially pure methane, comes off at the top of the tower, where it is conducted to a water entrainment catcher. Then the clean gas successively is passed through the second, third and fourth stages of compression. The gas is cooled after each stage of compression in order to condense and remove water vapor. From the last cooler the gas leaves at a minimum pressure of 3,200 lb. per sq.in.

The high-pressure gas line leading from the compressor connects with the high-pressure storage tanks and with the two charging manifolds. The storage tanks have a capacity of handling the output of the compressor for about 15 minutes. The compressor is capable of filling one cylinder with gas at 3,000 lb. per sq.in. in about three minutes. With a total of eight outlets on the charging manifolds for filling cylinders, one laborer, with some help from the operator, can take care of the filling of the cylinders and their movement to the loading platform.

A volume of 122,500 cu.ft. of methane gas would be obtained per day if all the excess sludge gas were cleaned of carbon dioxide. Since the compressor has a capacity of 125 cu.ft. of raw sludge gas per minute, approximately 16 hours of operation per day would be necessary to process all of the gas for motor fuel.

About 20 percent of the gas would be consumed in the gas engines running the compressor. However, this gas could also be used as motor fuel and an electric motor used for the compressor, if other city trucks such as the construction department vehicles were converted to the use of methane fuel. However, the operation of the process proposed in this report is based on supplying only the garbage trucks. Because of their size they are best suited for the use of compressed gas as motor fuel.

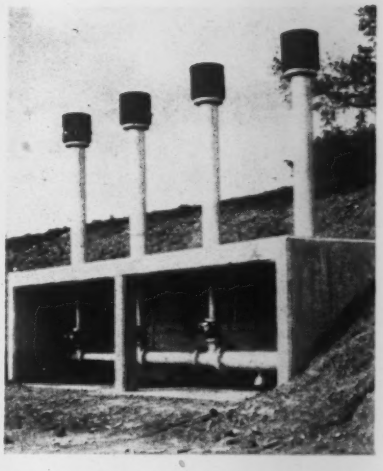


Fig. 2. Waste burners are now idle because excess gas is used for fuel.

The truck cylinders have an internal volume of approximately 1.75 cu.ft. each. They are 9 in. in diameter and 5 ft. long. Each cylinder, when filled with clean gas at 3,000 lb. per sq.in., holds 14.5 lb. of methane. The empty cylinder weighs about 136 pounds. On this basis, 175 cylinders could be filled each eight-hour shift.

Economic analysis

The various items of expense involved in the production and utilization of gas for motor fuel would be:

Structural work	$2,200
Compressor and engine	9,400
Absorption tower (CO_2)	6,000
Cooling tower	1,000
Storage containers	1,500
Fuel gas cylinders	8,750
Conversion of truck engines	5,670
Total	$34,520

The annual fixed charges on this investment are estimated to be $6,023, and the operating costs would probably be $9,720. Thus the total cost per year would be $15,743.

Sixty trucks traveling an average of 25 miles per day require 430 gal. of gasoline (on basis of 3.5 miles per gal.). At the present price of 15c. per gallon of gasoline, the use of compressed gas would yield a daily saving of $64.50, or an annual total of $19,350.

The net saving thus would be $3,613. It should be emphasized, however, that this applies only to utilization of half the excess gas.

Cement Dispersion and Concrete Quality

E. W. Scripture, Jr.
Director, Master Builders Research Laboratories
Cleveland, Ohio

***Contents in Brief**—Making the cement in a concrete mix more effective is the purpose of dispersing agents. By this action, clumps of cement are separated into individual particles, thus presenting a greater surface area for hydration and requiring a smaller amount of water for a given consistency. Dispersion is equally effective with normal and special portland cements. Dispersion is related to economy by making the concrete more placeable, and by improving its durability and strength. The cost of a dispersing agent is roughly equivalent to that of three-quarters of a sack of extra cement per cubic yard of concrete, but the results are more beneficial since there is no tendency to increases in volume change and heat evolution.*

APPLICATION of the principle of dispersion to hydraulic cements has recently assumed considerable importance in concrete construction and has found widespread use in the defense building program. Although dispersion of finely divided solid material in a liquid is not in itself new, having been employed in ceramics, dyeing, and other fields, dispersing agents are, however, specific in nature, so that a reagent that acts to disperse some particular solid-liquid system may or may not react in a similar manner in some other system. Furthermore, an effective dispersing agent may interfere with other reactions of the system, so that the use of dispersion in the field of concrete and mortar has awaited the development of effective cement dispersing agents that would not interfere with the normal reactions of hydraulic cements. Such reagents were discovered about 10 years ago and since that time have been developed in the laboratory and the field; by now they are established as a practicable means of considerable importance for improving the properties of concrete.

How dispersion works

When portland cement is mixed with water the individual particles tend to gather together and stick to each other in clumps—*i.e.*, the solid-liquid system is flocculated. This is due to lack of mutually repellent electrostatic charges on the cement particles. If a suitable dispersing agent, which introduces such electrostatic charges, is added to the mix the clumps are broken up, and the cement then acts as individual particles—in other words, is dispersed.

Dispersion of the cement produces two important effects. The water that had been trapped within the particle clumps is released to become a part of the mixing or placing water. The surface area of the cement in contact with water is greatly increased since the particles are no longer in contact with each other. As a result of the first effect the amount of water required in the mix for a given consistency is less—*i.e.*, the water-cement ratio is reduced. Since the value of the cement is dependent on a hydration reaction, which is a surface phenomenon, the second effect, which promotes more rapid and more complete hydration, permits more efficient utilization of the cement. By the reduction in water-cement ratio and by the increase in surface area of cement available for hydration, the potential value of the cement is more completely realized.

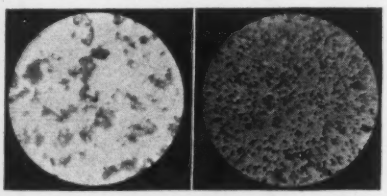


Fig. 1. Photomicrographs show difference between flocculated (left) and dispersed (right) suspensions of cement in water.

Relation of dispersion to admixtures

Materials classed as concrete admixtures have fallen into some disrepute because few actually produce all the beneficial effects claimed for them while some are actually deleterious. Also, the same beneficial effects can often be secured at less cost by other means. Nevertheless, for certain purposes, admixtures may be the most economical and satisfactory means of producing a specific desired result.

Admixtures may be divided into a number of different classes according to the specific effects that they are intended to produce. These include accelerators to increase the rate of setting and hardening; waterproofing pastes and powders to add a water-repellent quality; finely divided powders to supply a deficiency of fines including those of a puzzolanic nature to add sulphate resistance; and those of a cementitious nature to add strength and in some cases to improve cohesiveness. Foaming agents and protective colloids reduce water-cement ratio but usually without a corresponding increase in strength although they may improve resistance to freezing and thawing by entrainment of air.

While cement dispersion might loosely be called an admixture in that it involves the addition of a dispersing agent to the mix, such a designation is misleading since the action differs fundamentally from that of materials that in the past have been known as admixtures. The latter have been intended to add some extraneous material to the concrete to produce certain results, whereas cement dispersion is simply a means of utilizing the cement itself to greatest advantage.

The various objectives attained by the use of admixtures can, in many cases, be realized by the use of additional cement, with proper design of the mix. And since the extra cement is usually less expensive than the admixture, it is difficult to find justification for their use, although there are a few exceptions. Where the capillary attraction of concrete for water is a factor, waterproofing pastes or powders of good quality may be warranted. Where resistance to sulphates is important, puzzolanic additions may be useful. Entrainment of air by foaming agents and protective colloids, to increase resistance to freezing and thawing, may also be admissible if a loss in strength is not objectionable. And calcium chloride as an accelerator, particularly in cold weather, seems justified if purchased as such at a reasonable price.

Dispersion, as stated, attacks the fundamental problem of making the cement more effective. In those cases where additional cement will produce the same result as the admixture, use of a dispersing agent may be considered preferable because it produces the desired specific effect without the possible deleterious effects of the admixture on the other properties of the concrete but instead with improvements in them. For example, dispersion will produce greater workability with a decrease in water-cement ratio instead of the increase required when fines are used. It will also increase durability with increased strength instead of the losses in strength attendant on the use of reagents that entrain air.

Certain admixtures do produce results that are not secured by additional cement, including water-repellency, puzzolanic activity, and to some extent the increased fattiness and durability secured by air entrainment. If, for some reason, one of these effects is considered desirable in a particular instance, then the most efficient and economic method of securing the specific effect and also the highest quality of concrete in other respects is to design the mix to use the cement itself as effectively as possible through dispersion and in addition to add the appropriate admixture.

What dispersion does

Those properties of concrete that are dependent on the surface area of the cement and on water-cement ratio, and this includes most of them, must necessarily be improved by dispersion. These effects are realized in the concrete both in its plastic stage, that is during mixing and placing, and also subsequent to hardening.

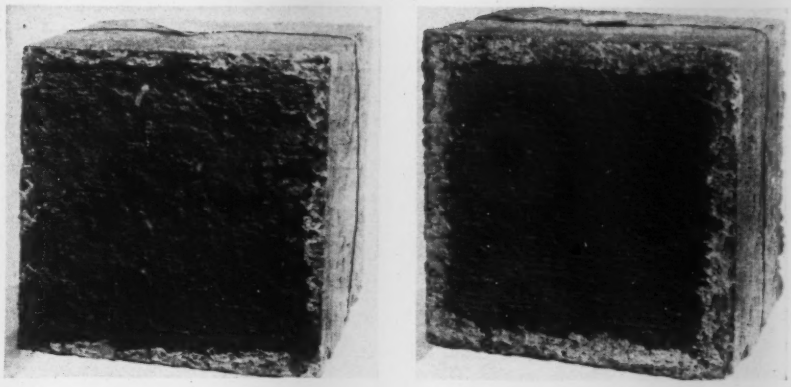


Fig. 2. How 25 cycles of surface freezing and thawing with calcium chloride leave blocks of concrete made without a dispersing agent (left) and with a dispersing agent (right). Both mixes of same design and consistency. Both blocks cured 28 days and broom-finished.

During the plastic stage dispersion of the cement in a given mix will produce more placeable concrete with less water, due to the release of water from the cement clumps. The fattiness of the mix is increased, while segregation and bleeding are reduced, due largely to the increased effective surface area of the cement. Volume change before hardening is markedly decreased, due in part to the lower water content and in part to the greater surface area.

A greater uniformity and freedom from gross defects of the hardened concrete may be expected from the improved properties in the plastic stage. Greater watertightness with reduced permeability and absorption are realized through the lower water content required for placing. Higher strengths and greatly increased durability with respect to both freezing-and-thawing and sulphate corrosion may be attributed to the lower water-cement ratio of the dispersed mix and to the increased surface area available for hydration.

It is not suggested that cement dispersion is a panacea for all ills. Poor concrete will continue to exist due to poor workmanship, poor mix design, defective materials or other causes whether the cement used is or is not dispersed. What cement dispersion will do is to improve the quality of good concrete or minimize the defects of poor concrete by attacking the

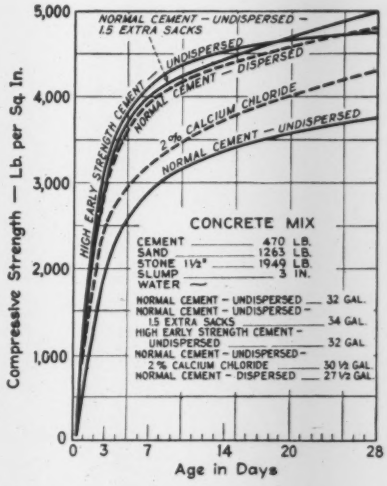
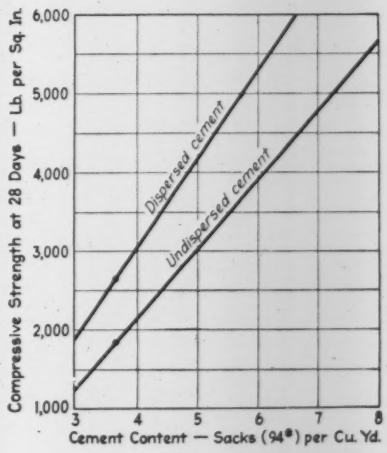

Compressive Strength — Lb. per Sq. In.
5,000
4,000
3,000
2,000
1,000
0
0 3 7 14 20 28
Age in Days
NORMAL CEMENT — UNDISPERSED — 1.5 EXTRA SACKS
NORMAL CEMENT — UNDISPERSED
NORMAL CEMENT — DISPERSED
2% CALCIUM CHLORIDE
NORMAL CEMENT — UNDISPERSED
HIGH EARLY STRENGTH CEMENT
CONCRETE MIX
CEMENT 470 LB.
SAND 1263 LB.
STONE 1½" 1949 LB.
SLUMP 3 IN.
WATER —
NORMAL CEMENT — UNDISPERSED 32 GAL.
NORMAL CEMENT — UNDISPERSED — 1.5 EXTRA SACKS 34 GAL.
HIGH EARLY STRENGTH CEMENT — UNDISPERSED 32 GAL.
NORMAL CEMENT — UNDISPERSED — 2% CALCIUM CHLORIDE 30½ GAL.
NORMAL CEMENT — DISPERSED 27½ GAL.

Fig. 3. Comparisons of high-early-strength concretes obtained by various expedients.

Fig. 4. How compressive strengths and cement contents compare for dispersed and undispersed mixes, based on 28-day test results.



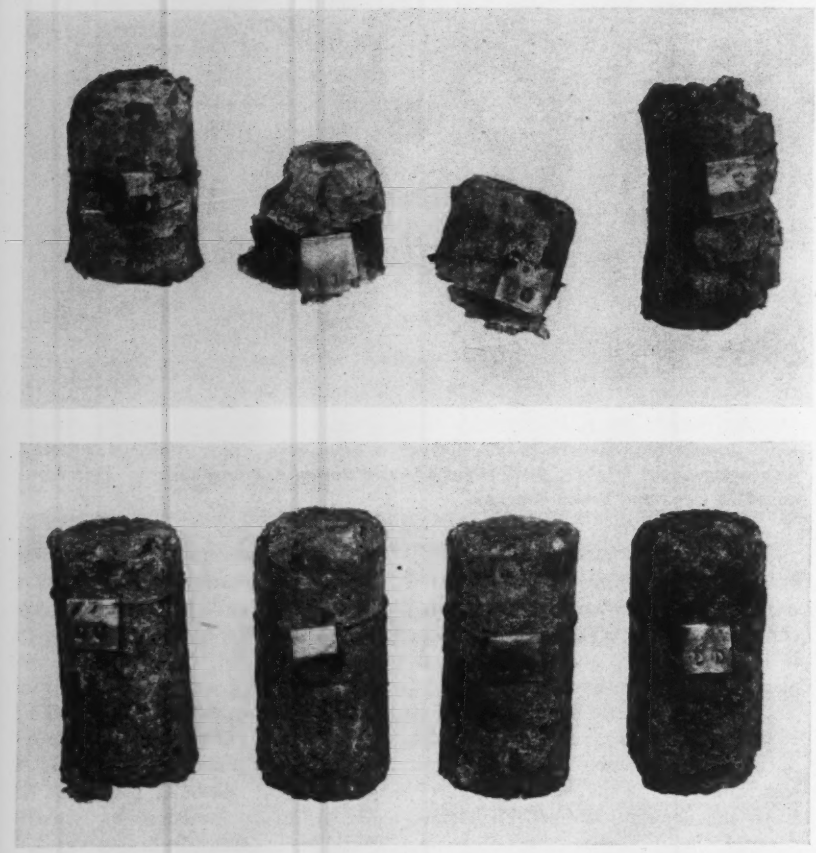


Fig. 5. Comparison of disintegration of concrete cylinders (dispersed cement below and undispersed above) after 2 yr. in 8-percent magnesium sulphate solution that was changed weekly. All mixes of same design and consistency and cured 28 days.

problem along the fundamental line of using the cement more effectively.

Dispersion and special cements

Special cements have been used more or less widely for many years but have recently received recognition in federal specifications and in the recently adopted A.S.T.M. standard, which divides portland cement into five types. A special cement is a more or less drastic modification of a normal portland cement, now Type I of the A.S.T.M. standard, by change in chemical composition, in physical character, or by intergrinding some other material with the clinker to enhance some particular property of the cement without materially changing its other properties. The names of the special cements usually indicate which properties are intended to be improved, and the more important varieties are: high-early-strength, corrosion-resistant, low-heat, modified low-heat, puzzolan (blended), natural, and waterproof cements. There are also a number of cements containing various grinding aids such as resin, beef tallow, vinsol resin, TDA and others.

A suitable dispersing agent will affect the special cements in the same manner that it affects a normal portland cement, namely, reduce the water-cement ratio and increase the surface area available for hydration. Consequently, the application of dispersion to the special cements is equally important in utilizing them to fullest advantage and securing improved properties of the concrete.

If some particular property such as high early strength or corrosion resistance is desired, the problem is one of selecting the most effective and economical means of realizing the desired result. For example, high early strength may be produced by use of high-early-strength cement, by additional normal portland cement, by an admixture of calcium chloride, or by cement dispersion. In other cases, however, the specific property may only be secured to its fullest extent by use of a special cement, as, for example, a waterproof cement that introduces a water-repellent material.

In many instances of the first type, the most effective and economical way to produce the result in question will be to use a normal portland cement and a dispersing agent. If this is not the case or if the situation is of the second type, then the use of a special cement is indicated, but in order to realize the full potentialities of the special cement a dispersing agent should be used with it. In the case of blends of natural cement with portland cement, or of cements ground with materials such as vinsol resin, which entrains air, care should be exercised that the increased fattiness produced by dispersion added to the air-entraining tendency of the cement itself does not cause excessive air entrainment and consequent reduction in strength. This may be avoided by minor modifications in mix design.

Economics of cement dispersion

Granted that the application of the principle of dispersion to cement will produce definitely large improvements in the properties of the concrete, the question will naturally arise whether the value of the improvement is greater than the cost of dispersion. The economies to be effected will lie in the original cost of the materials making up the concrete mix, in the initial cost of the concrete in place as affected by workability, segregation, etc., and in the eventual cost of the structure as determined by maintenance and length of life.

The last two of these are somewhat intangible and difficult to express in specific monetary terms, but there can be little question that a more placeable concrete with less tendency to segregation will reduce labor costs in placing, finishing, patching, and rubbing. Whether these savings in themselves will pay for the cost of dispersion will depend on the conditions on any particular job. Likewise it is hardly to be doubted that a more watertight, durable concrete will reduce the cost of maintenance and effect a saving by extending the life of the structure. Whether the savings so effected justify the cost of dispersion will depend on the severity of exposure conditions.

Materials costs can be compared much more definitely and are of general applicability. A suitable basis of

comparison can be found in the relation between cement dispersion and the amount of additional cement required to produce similar results. Although there will be minor variations in different localities the cost of dispersion in an average concrete mix of between five and six sacks of cement per cubic yard may be taken as approximately equal to the cost of adding three-quarters of a sack extra cement.

Data have been accumulated both in the laboratory and in the field that show that dispersion of the cement in a given mix will produce a strength equal to or greater than that from one additional sack of cement, and will produce greater workability with respect to both mobility and cohesiveness; greater durability with respect to resistance to both freezing-and-thawing and sulphate corrosion; and increased watertightness with respect to both absorption and permeability than will one additional sack of cement. Further, dispersion of the cement will reduce volume change and will decrease heat evolution. These are entirely beneficial results, whereas additional cement will have the opposite effects.

In view of these results it would seem that cement dispersion is a more economical means of producing a desired effect than is the addition of extra cement. How this economic advantage will be utilized will depend on the requirements in each case. When high quality is not a factor it will be used to produce a given quality of concrete at a lower cost. Where quality is the primary consideration dispersion will produce maximum quality at a given cost.

Mobile Ozone Unit for Water Purification

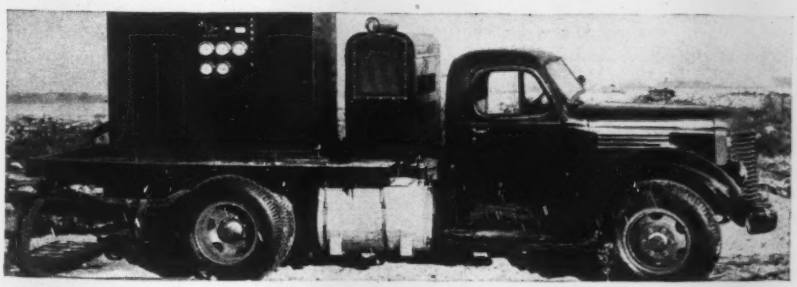
A MOBILE OZONE water purification plant designed for Army camps, for use with troops on maneuvers and for certain industrial and municipal applications as well, was recently demonstrated in Los Angeles. The unit pictured in the accompanying illustrations has a capacity up to 150 gpm.

River water is pumped from the source through a filter to remove suspended matter and then passed through an absorber chamber where ozone, generated by a high-frequency silent electric discharge oxidizes bacterial contamination. The sterilizing agent is ozone gas, generated within the unit from filtered and dried air.

Power is supplied from a gasoline-engine-driven 10-kva., 220-volt, three-phase unit. This unit is self-starting and self-regulating. The operating mechanism is driven by a 5-hp. electric motor on which is direct-mounted the treated water supply pump and coupling; connected to the other end of the motor is the raw water supply pump. Also driven from the motor shaft by V-belts are the compressor, cooling water circulating pump and the evaporative cooler.

Ozone is generated by the silent blue electric discharge between aluminum plates maintained at 13,000 volts by a 2-kva. transformer. Ozonized air is injected directly into the absorber through which it flows counter-current to the water in four separate stages. The latter provides diffusion, injection, turbulation and scrubbing action to obtain efficient absorption of the ozone. From the absorber the treated water passes directly through the supply pump, at a pressure equivalent to a 50-ft. head.

Operation of the unit, which was developed by the Technicraft Engineering Co., of Los Angeles, is fully automatic. A small synchronous electric motor drives time dials that control the cycle and periodically reverse the raw water filters and dehydrators. The filter out of service is back-washed and the dehydrator out of service is electrically regenerated. Where requirements are greater than 9,000 gal. per hour, units set up in parallel operate automatically to meet requirements.



Sand bags in the Los Angeles River bed form a temporary reservoir for ozone purification tests recently conducted for Army and municipal engineers. The mobile unit carries a filter, ozonator, pumping equipment and gasoline-driven electric power plant.

Fig. 1. Core pool at an early stage of the work, looking toward the spillway and intake tower.

Hydraulic Fill at Knightville Dam

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***Contents in Brief**—Knightville Dam, first of a series for control of floods in the Connecticut River, was built by hydraulic-fill methods under careful engineering control that resulted in a close approximation to the theoretically correct distribution of material in the dam. Details of the method of construction and control of materials are given.*

KNIGHTVILLE DAM in western Massachusetts is the first dam to be completed under the plan for flood control of the Connecticut River as outlined in *ENR*, July 17, p. 82. It was built by hydraulic fill while the other two dams of the flood control project that are now under construction, Birch Hill and Surry Mountain, are rolled-fill structures.

Knightville Dam is on the Westfield River, a tributary of the Connecticut 4.6 miles north of Huntington, Mass. It consists of an embankment 1,200 ft. long and 160 ft. high above river bed containing 1,200,000 cu.yd. of hydraulic fill and 120,000 cu.yd. of rolled fill; outlet works consisting of a tunnel 600 ft. long through rock in the west abutment; a concrete control tower housing three service gates, three emergency gates and trashracks; and an emergency spillway. The latter consists of a curved concrete overflow structure 70 ft. high with an ogee section 400 ft. long. It is located in a natural valley at the west abutment and is flanked at its easterly end by a concrete retaining wall that forms the west abutment for the upper 40 ft. of the embankment. The spillway has a maximum discharge capacity of 85,000 cfs., or 50 percent above the maximum predicted flood. The spillway crest is at El. 610, 20 ft. below the top of the fill.

The dam lies in a narrow valley where rock was exposed or covered only by a thin layer of soil over a considerable part of the west side of the valley. The east side of the valley is composed of compact glacial till lying over the bedrock, varying in thickness from a few feet at the river bed to 160 ft. near the east end of the embankment. This glacial till is spotted with small and large boulders, and the river channel, about 100 ft. wide, was full of boulders and cobbles of varying size.

As the upper 10 to 20 ft. of rock in the west side of the valley was cracked and broken to some extent, it was grouted through holes 20 ft. deep and a grout curtain 20 ft. deep was placed along the center line of the dam in the west abutment.

Embankment construction

At the beginning of construction two borrowpits were designated, one high on the east abutment in glacial till interspersed with boulders and one in the stream valley above the dam where sand and gravel interspersed with fine sand and silt and with a high percentage of large and small rock was found. It was proposed to use this latter pit for the pervious part of the fill, obtaining fine material from the upper pit, but soon after operations got under way it was found that there was an excess of fine material in the lower pit from which the coarse material was to come. This resulted in abandonment of the pit

for fine material and the opening of a third pit for coarse material in order not to have to waste fine material from the core during the construction operations.

The borrow areas yielded about 18 percent of stone over 6 in. in size, which was used for riprap.

Hydraulic operations

The plant for the hydraulic filling is shown schematically in Fig. 3. Borrowpit material was excavated by two 2½-cu.yd., one 1¾-cu.yd. and one 1½-cu.yd. shovel and was hauled in tractor trucks having capacities ranging from 8 to 12 cu.yd. and dumped on the 16-in. bar grizzly at the hydraulic plant. Material passing the grizzly was fed onto a 36-in. conveyor belt having a capacity of 700 cu.yd. per hour which delivered it to a shaker screen where material larger than 6 in. was taken out before the material was discharged into a concrete "hog-box." Water was added in the hog-box and the mixture passed by gravity into a 20-in. dredge pump of 1,200-hp. capacity that forced it through an 18-in. flanged-joint pipe to the fill.

Material retained on the grizzly and shaker was hauled by truck to the fill where it was used for slope protection. It amounted to about 18 percent of the pit material.

On the fill the material was handled in 18-in. slip-joint pipe held together by twisted wire, the pipe being carried on blocks near the outer limits of the fill. The pumped material, ranging from 10 to 18 percent solid, was discharged from the open end of the pipe. Care was exercised in limiting the discharge to a narrow spread on the beach in order to maintain enough volume and velocity to carry the fine sand, silt and rock flour out of the coarser materials into the core pool and to spread the coarser materials down the beaches so that the transition from the core to the coarser material making the shell would be limited to a narrow zone. Baffle boards parallel to the core pool and spaced about 15 ft. apart were used to keep the shell material from encroaching into the core, the first line of baffles being set 10 ft. outside of the theoretical core limit. This broke the velocity enough to deposit the greater percent of the fine sand, the remainder penetrating into the pool (when the pool limit was at its minimum) and into the core for a short distance

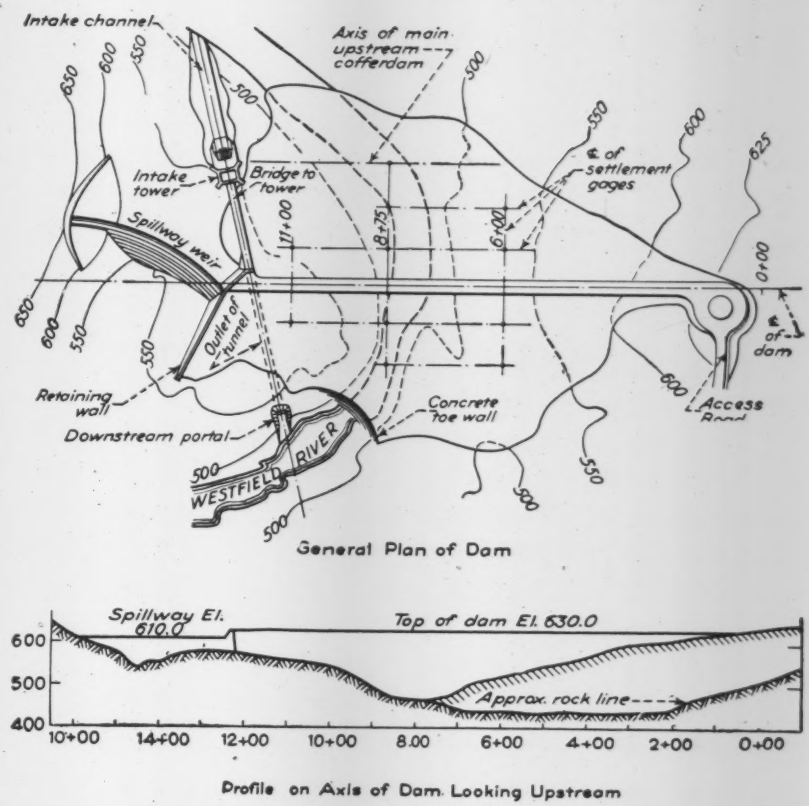


Fig. 2. Plan of Knightville Dam and a section along the axis to show the rock line.

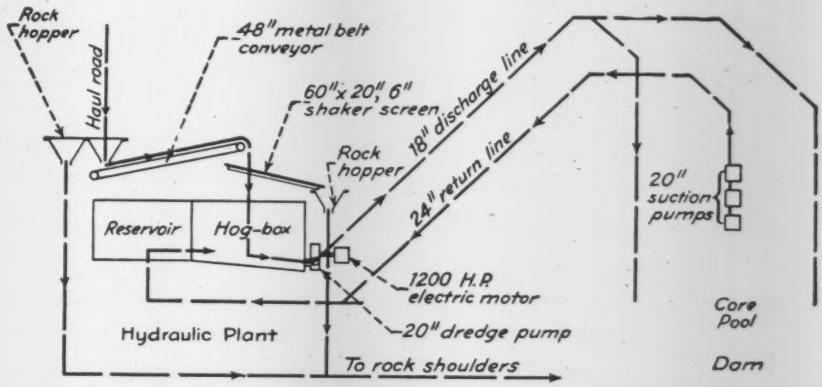


Fig. 3. Schematic arrangement of the hydraulic plant for moving materials.

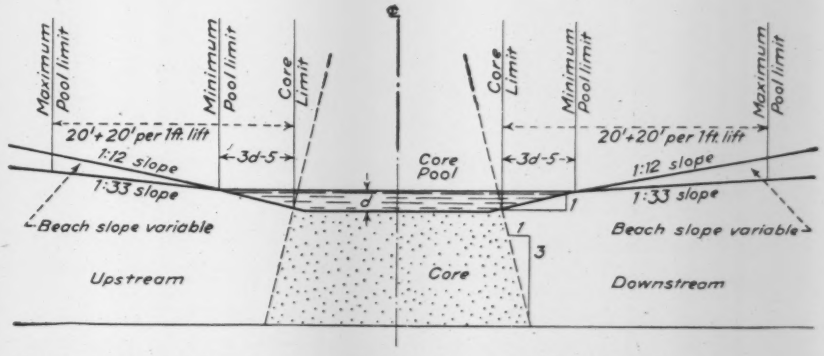


Fig. 4. Method of core control used in the hydraulic fill operations.

Fig. 5. Typical shell conditions as shown by one of the beaches.

where the deeper waters of the pool broke the velocity entirely allowing the rest of the fine sand to deposit at once. This produced an overlap of the shell material into the core approximately 20 percent of the width of the core, leaving 60 percent of the theoretical core clear of sand at all times. Due to the fact that the pool was outside the minimum limit for the greater part of the time, the core was mostly clear of sand for 80 percent of its width. The range of core materials is shown roughly in Fig. 6.

End discharge from the pipe was used, generally starting at one end of the dam and holding the discharge there until the pool in that vicinity was pushed into the minimum limit. One, two and sometimes three joints of pipe then were added or taken off and the discharge moved to a point where the pool was at a maximum limit, where operations were repeated. When the pool on one side had been pushed to the minimum limit for its entire length, it was raised in elevation to allow it to go out to the maximum limit on the opposite side of the center line. A reverse trip then was made across the side just pumped and the pool again pushed to the minimum limit. When this operation had been completed the discharge was switched to the opposite side and a similar operation repeated.

Water collected in the core pool was picked up by core pool pumps (three 20-in. suction pumps capable of delivering 12,000 gpm. at 120-ft. head), which returned the water to the hog-box through a 24-in. line of plain pipe with flexible couplings. To replace water lost by seepage through the fill, a makeup pump was installed in the river that could deliver 2,500 gpm. to the hog-box.

Draglines were used to build a protective levee behind the pipeline to prevent water from running down the face of the dam. The hydraulicked shoulders were compacted by operating a 90-hp. tractor over them at top speed.

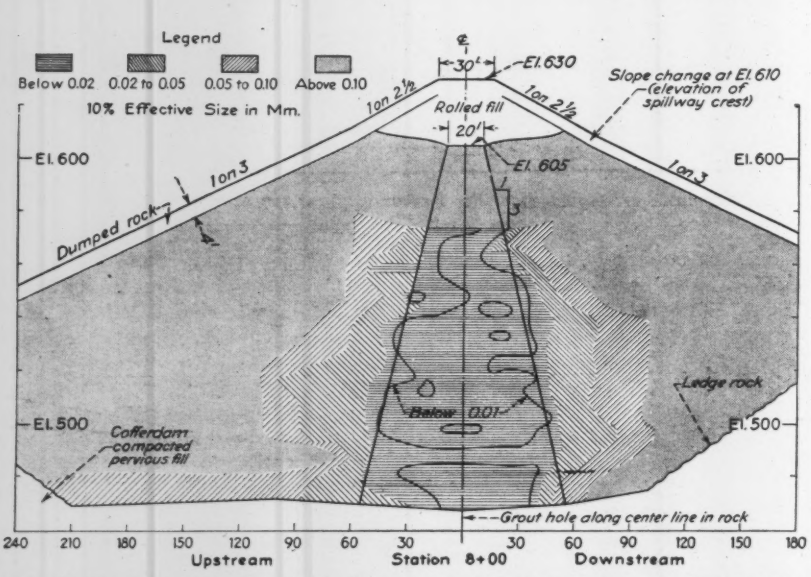


Fig. 6. Chart of the 10-percent-effective-size distribution at a typical section through the dam (station 8+00).

Material in the dam

In the preliminary studies it was determined that for a combined storage and flood-control dam such as was proposed for Knightville, core material with a 10-percent effective size (the grain size such that 10 percent of the material is finer) of 0.02 mm. was suitable (coarse limit). Fig. 7 gives the core-limit curves and some typical curves from the core material as placed in the dam. With a maximum size for the core of 0.02 mm. an attempt was made to obtain an average of 0.2 mm. or greater for the 10 percent effective size of the shell material.

The shells at Knightville are made up of material ranging in size from 6-in. stone to fine sand. The fine sand is almost 100 percent in the zone commonly known as the transition zone located next to the core, and is relatively narrow. The rest of the shell is composed of coarse sand and gravel. The gravel starts small and works up to large sizes, averaging over 2 in. in the outer portions. There is no portion of the shell that is gravel alone as the coarse sand settled out with the gravel as soon as discharged from the pipeline. This sand mixed with the gravel reduced the 10-percent effective size of the shell considerably. The inner portion of the shells (transition zone) averages around 0.1 mm. for the 10-percent effective size, the middle portion will average around 0.2 mm., and

the outer portion around 0.4 mm. This gives an average for the overall of the shell of around 0.233 mm. The result, roughly, is shell permeabilities 100 times that of the core, thus keeping the seepage line well inside the embankment, insuring greater stability.

Scarcity of clean coarse material in the borrowpits at Knightville made it necessary to take special steps to insure shells of clean, relatively coarse material, also that the fine material was washed out of the mixture and deposited in the core or in the inner portion of the transition zone. This left shells having free drainage and the necessary stability. Core material lenses in the shell were removed by digging with a dragline when they were more than 12 in. thick and one-half the width of the core beyond the theoretical core limit.

Core pool control

The method of core pool control used at Knightville Dam is shown in Fig. 4. The minimum limit was set a distance from the theoretical core limit as given by the formula $3d - 5$ ft. where d is the depth of the core pool. This comes about from the fact that, in general, sand deposited by running water under still water will assume a slope of 1:3. The 5-ft. deduction was made so that there would be a slight overlap of the shell material into the core to counterbalance the core material in the shell. The maximum limit was set as the distance from the minimum limit such that the time required to push the pool by pumping material onto the beach from its maximum limit to the minimum limit would not allow core material to deposit on the shells underneath the pool. The distances shown in Fig. 4 were found quite generally to be correct. The maximum limit was started at 50 ft. and later changed to 40 and 35 ft. from the core limit.

Field control

After each operation the inspectors sounded the core with aluminum pipes to determine whether sand had intruded into it. Sand layers can easily be found by this method due to the "feel" of the sand on the pipe as it is pushed into the core. Each inspector was trained to know suitable core material by its appearance, its feel between the fingers and by its reaction under the push of the sounding pipe. Some lenses extending into the core a distance equal to 25 percent of its width were removed by a dragline operating from the shoulders.

Each morning the pool was sounded with a 3-lb. weight 3 in. in diameter. The increase or decrease of depth of the sounding told whether the percent of core material in the mixture had to be increased or decreased. These soundings also were used as the basis for setting the minimum pool limit.

The depth of pool varied between 3 ft. and 1.5 ft., except on rare occasions when some short length of pool increased to 5 ft. for a short period. A uniform 5-ft. depth of pool was wanted, but, due to excess of fine material, was seldom obtained.

Engineers and inspectors in charge of the embankment work kept close control over the excavating operation in order to keep the material coming to the hog-box as close as possible to the desired proportions of fine and coarse material in the fill. Their judgment was checked by routine sampling from the shell and core. Samples were taken from the

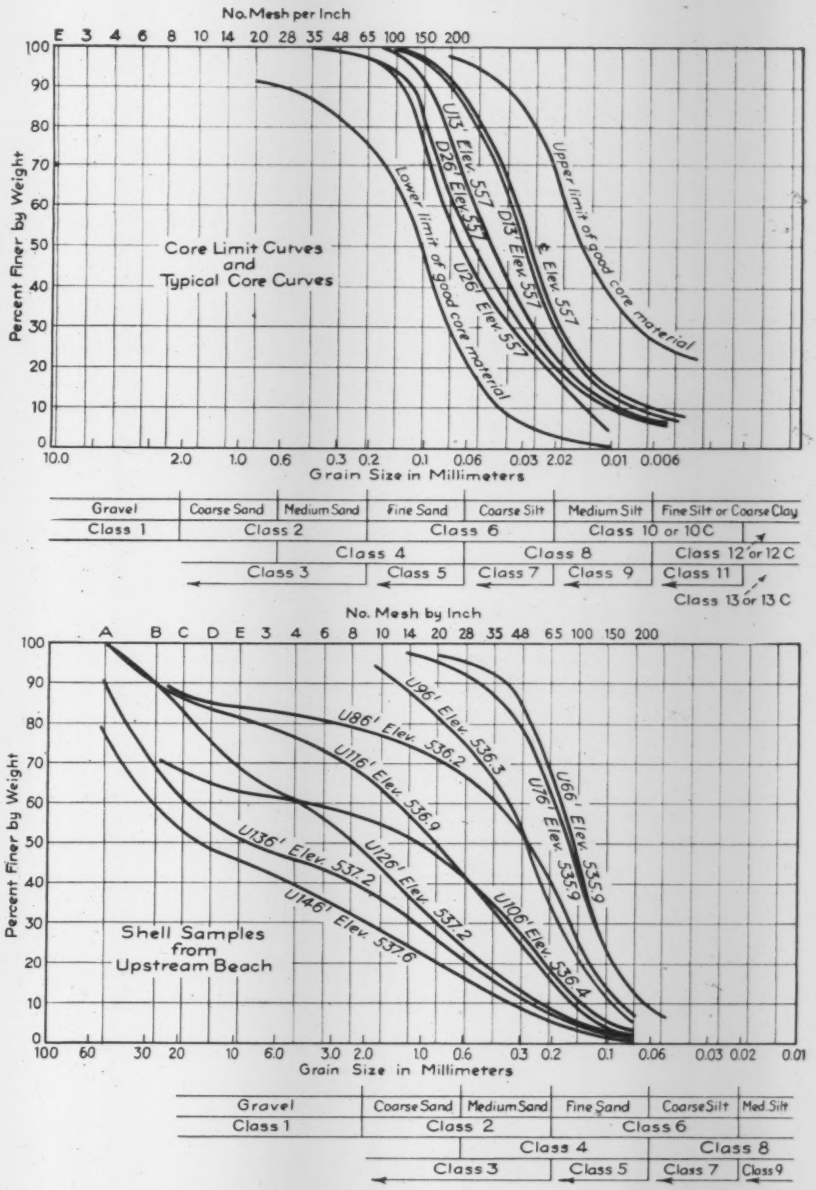


Fig. 7. Range of material sizes in the core and shell. Material in the core fell well within the upper and lower limits for good core material. In the shell the percentages of coarse materials were high. Symbols on the curves indicate distances upstream or downstream from the center line.

shell at every 100-ft. station at 50-ft. intervals upstream and downstream from the center line. Samples were taken, one for each 10-ft. increase in elevation, and the elevations were staggered, rising 1 ft. at each station for ten stations. This gave one sample for approximately every 900 cu.yd. of material. Special samples were taken in the shell to determine the density before and after compaction by the tractor.

The core was sampled on every 100-ft. station at the center line, quarter point and theoretical limits. One sample was taken for each 5-ft. increase in elevation, elevations being staggered, rising 1 ft. at each station for five stations. This gave one sample for approximately every 400 cu.yd. of core material. Special samples were taken on three stations at 10-ft. elevations and retaken for every 10-ft. increase of load to determine rate of consolidation by measurement of water content. Another check on the consolidation of the core was made by taking soundings with a 6-in. cast-iron ball weighing approximately 33.5 lb.

Inspectors were charged with the following duties: seeing that core and shell materials were placed in their proper locations; locating and causing the removal of excessive overlap in either direction; inspection to assure that only suitable material was used; seeing that the proper amount of stone was placed on the slope; seeing that trash was removed from the shell and core pool, and seeing that the necessary lines and grades were adhered to.

Contract plans and specifications for the project were prepared in the office of the district engineer, United States Engineer Department, Providence District, under the direction of T. S. Burns, chief of engineering division and Col. J. S. Bragdon, district engineer. Construction was carried out under the direction of Col. H. P. Latson, chief of operations, and E. L. Beriswill, area engineer, with the author as resident engineer. George M. Brewster & Son, Bogota, N. J., was the contractor and T. J. Carney the project manager.

Construction work on the dam began in September, 1939; work on the embankment started in June, 1940, and was completed in June of this year. Work on the operating house and installation of operating equipment was completed in November.

Soil-Cement Blocks for Walls of University Research Laboratory

W. C. McNown
Professor of Civil Engineering
University of Kansas, Lawrence, Kan.

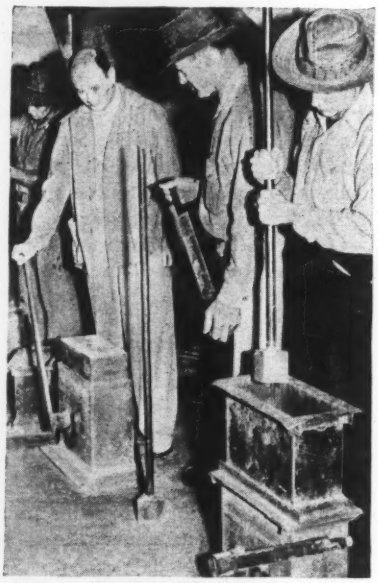
***Contents in Brief**—Building blocks made of a sandy loam mixed with 12 percent by weight of cement comprise the exterior walls of a new engineering research building under construction at the University of Kansas. Water content of the mix is about 10 percent. Compressive strengths of over 1,000 psi. and tensile strengths of 125 psi. are readily maintained. Good resistance to weathering is indicated by test. Insulating value is low, so blocks are being laid up in a double wall containing an air space.*

THE WALLS of a new laboratory building now under construction on the campus of the University of Kansas at Lawrence will be built of soil-cement building blocks, thus featuring the use of a new earth building material superior to the adobe blocks long used for building in the arid Southwest. The single-story laboratory building will have 7,000 sq.ft. of floor area in twelve rooms, and will house the engineering experiment station activities of the School of Engineering and Architecture as well as the University broadcasting station KFKU, providing space much needed for the expansion of both of these activities. It is an NYA project, the youth assigned work part time on the building and spend the remainder on national defense training in the university machine shops. Deep foundation work has been completed and that on the grade beams and service tunnels is progressing. Twenty thousand of the necessary 30,000 blocks have been made and the walls will be started early in the spring.

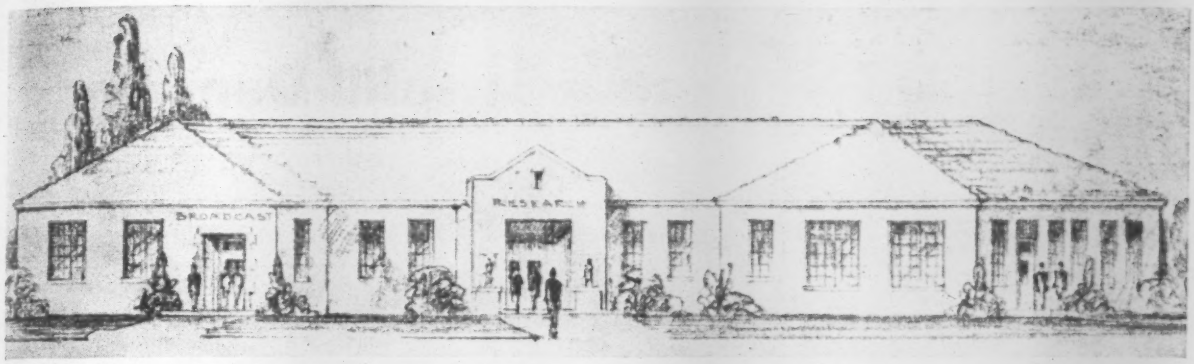
The blocks and how they are made

The blocks are made of a local sandy loam soil combined with 10 percent by weight of cement for those to be used in partitions and 12 percent for those to go into outside walls. The clay-silt-sand content of the soil varies in the pit, but by proper mixing the clay and silt may be kept at about 10 percent each, the balance being rather fine, poorly graded sand. Standard portland cement, 9 percent, and Fort Scott natural cement, 3 percent, are to be used in combination as the stabilizing agent for the blocks to be used in the outside walls. The Fort Scott Hydraulic Cement Co. is a cooperator, and the qualities of its product for such use are being investigated. The blocks are hand-rammed into cast-iron molds of original design made in the university machine shops. The tampers are of steel weighing 15 lb. and have a 3-in. square face. As soon as a block is compacted it is raised from the mold box by means of a lever and ratchet device, checked for weight, and placed in a moist room for curing, where it remains about two weeks under conditions similar to those used for curing other cement products.

The blocks have a 6x14-in. wall



Molds in which the soil-cement blocks are made. Manning the lever that lifts the block from the mold is John J. Jakowsky, dean of engineering.



Architectural rendering of Kansas University research building whose walls are to be built of soil-cement block.

face and are 4 in. thick. The finished face is at the bottom of the mold box and is given a $\frac{3}{16}$-in. bevel on the edges. The rammed face, which is rough-finished, will be on the inside of a 10-in. hollow wall made of two 4-in. thicknesses of blocks separated by a 2-in. air space, the outer and inner wall shells being tied at intervals with $\frac{1}{4}$-in. round steel rods.

Physical properties of the block

The quality of the blocks is being checked for weathering by freezing-and-thawing and wetting and drying tests. The minimum amount of cement to be used to stabilize the soil, $7\frac{1}{2}$ percent by weight, is based upon the freezing-and-thawing tests. However, to provide blocks that will not chip and scar too easily while handling through the period of curing, storing and moving into the walls requires more cement than that needed for stabilization.

Compressive strength check tests are made on standard 2x4-in. cylindrical specimens. The compressive strength tested damp is easily maintained above 1,000 psi. The tensile strength, as obtained from standard tension briquettes, is 125 psi.

The absorption of water, bone dry to saturated, averages about 8 percent for outside blocks. The change in length from oven-dry to saturated is about 0.8 in. per 100 lin. ft. The insulating quality is rather low, being the same as low-grade concrete, hence the desirability of using the hollow wall type of construction.

Since the general quality of the blocks increases rapidly with the density, the moisture content of the fresh soil-cement mix as it passes from the mixer to the ramming operation is kept as nearly at optimum as the factory requirements will permit. Too much water causes blocks to stick to the molds and makes them too tender to withstand early handling. About 10 percent of water by dry weight of soil plus cement is used. The factory requirement for water is that amount that will provide a consistency that is barely plastic under ramming. The mixer operator is trained to judge the consistency of the mix and to vary it as need be from time to time. Molds are dusted with natural cement to prevent sticking. Each block is weighed as it passes from the molds to the curing room, and any that weigh less than 26 lb. are immediately destroyed, thus keeping a minimum dry density above 120 lb. per cubic foot.

The ideal soil for building block purposes may be approximately 5 to 10 percent clay, 10 to 20 percent silt, and 70 to 85 percent graded sand. Heavy clay soils are not desirable, but may be improved by the addition of sand, which in itself need not be free from clay and silt. Two otherwise unsatisfactory soils may be used in combination, but as yet there seems to be no simple means available to the layman for classifying soils by determining the relative amounts of clay, silt, and sand.

The question of cost

The material cost of the block, exclusive of mortar, for the 10-in. hollow wall of the experiment station building is approximately 7c. per sq.ft. of wall area, or about the same as that of a 1 sq.ft. of a 1-in. board. The labor cost figured at the probable normal wage for such labor as is being used is 25c. per sq.ft. of wall. However, the labor used consists chiefly of unskilled youth who do very well when they gain some experience, but who, from the nature of things, come and go, and so bring about an abnormal labor turnover. Twenty youths and a supervisor will easily prepare the soil, mix the materials, ram the blocks, and attend to the work of curing and storing of 45 blocks per hour.

No consideration is being given in this writing to possible commercial production of soil-cement building units using a hydraulic press and including all the advantages of equipped and organized production.

So what have we? Time will tell. Here on the Campus we joke about our "mud block house." Abroad over the country the interest has been great; inquiries have poured in from both urban and rural sections. The material has passed satisfactorily all reasonable laboratory tests, but such tests lack the all important element of time that is required to prove the quality of a building material that is to be subjected to exposed conditions. However, there seems good possibility that stabilized earth prepared as a material for the making of the walls for buildings can serve low-cost housing needs in the more humid regions as adobe has served so long in the arid sections.

The factors that may be used to judge the value of a building wall material are: (1) strength sufficient to carry the imposed loads; (2) resistance to weathering with or without protective coatings; (3) insulating value; (4) original cost; and (5) cost of maintenance. The walls of the engineering experiment station building have strength beyond the needs. No protective coatings such as paint or stucco will be placed upon them. The soil used gives the blocks a reddish brown color, rendering decorative painting unnecessary. The hollow wall will be insulative and the material cost very low.

Some time in the future we may add another chapter to the story.

Oil Used in Testing Earthfill Density

Stephen Poe
Assistant Engineer
Bureau of Reclamation, Denver, Colo.

***Contents in Brief**—Glacial material up to 3-in. size in Green Mountain Dam embankment, with resulting problem of irregular test holes combined with local sand of angular characteristics, resulted in studies to determine feasibility of using oil for measuring volume in field density determinations of compacted fill. Experiments indicated advantages of oil under local conditions. Tests showed oil gave accuracy to 0.4 percent of actual dry density as compared to 3.1 percent deviation for sand.*

NEED FOR AN accurate, expedient and economical method of measuring volumes of field density test holes in the compacted earth embankment at Green Mountain Dam led to a series of field and laboratory tests aimed at developing a procedure especially adapted to local conditions. This testing program provided sufficient data to warrant the adoption of oil as a measuring substance in place of calibrated sand, and afforded the consequent elimination of many of the objectionable features of the sand method.

Green Mountain Dam is being built by the Bureau of Reclamation on the Blue River south of Kremmling, Colo., to provide replacement storage in connection with the Colorado-Big Thompson project. When completed the dam will be 309 ft. high and will contain 4,285,000 cu.yd. of earth and rockfill. A description of its design and the function of the storage appeared in *ENR*, Jan. 5, 1939, and progress articles were published Aug. 8 and Dec. 5, 1940.

Problem of field testing

Generally, the accuracy of field density tests on compacted embankments made by using sand for volumetric determinations is dependent upon: (1) smooth, uniform test holes, (2) sand with a narrow limit of grain sizes and preferably with round particles, (3) skilled operators.

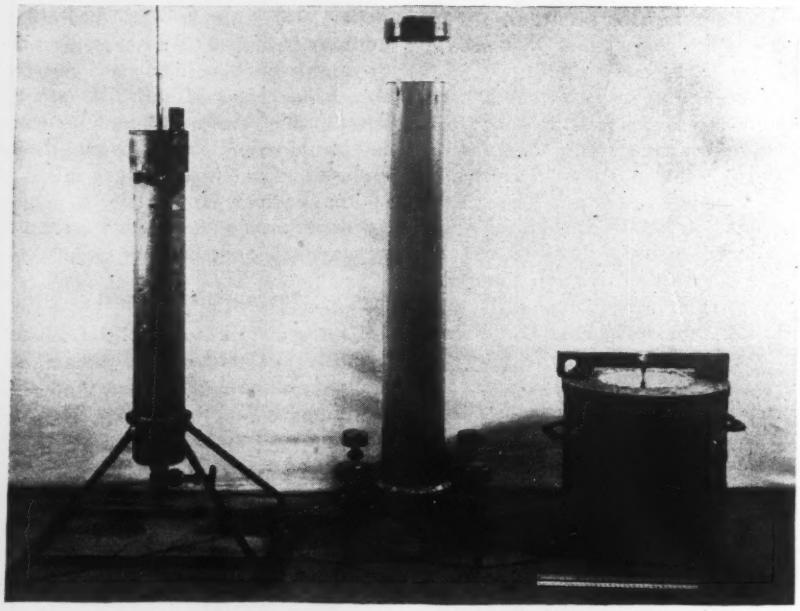
Material for the earthfill at Green Mountain Dam is a glacial till containing about 37.0 percent rock (larger than ¾ in. and passing a 3-in. grizzly) which makes true, smooth-walled test holes impossible because of the removal of rocks from the test holes. Sand in the vicinity is angular in shape and fairly evenly graded, requiring expensive screening to obtain the desired narrow range of particle sizes.

These conditions indicated that considerable difficulty might be experienced in obtaining accurate tests with sand, and laboratory experiments with oil were undertaken before the placing of earthfill was begun in 1940. These tests were substantiated by field tests during the 1940 construction season and with additional laboratory studies this year.

Although other agencies had employed oil as a measuring substance, few data were available and it was necessary to develop equipment and procedures.

Tests were made in the field laboratory to determine first the comparative accuracy of the oil and sand methods of volumetric measurement. When these tests were completed, it was definitely established that some oils provided a much higher degree of accuracy than sand, and that the use of sand under local conditions did not provide data sufficiently accurate for control tests.

Early in the work it was indicated that motor lubricating oils were well adapted to the tests because of their controlled viscosities and their availability. They provided accurate measurements if they were viscous enough to prevent seepage into the soil and



Equipment developed for use of oil in density determinations showing (left to right): original volumeter of 4-in. galvanized pipe with float; improved volumeter of plastic, graduated and equipped for leveling; and straddle level for accuracy in filling test holes with oil.

still sufficiently fluid to be drained from a metering device in a short time interval.

Test equipment developed

For laboratory density determinations, materials were compacted in a 14-in.-dia. by 14-in.-height cylinder at known densities and density tests were taken in the compacted materials under conditions similar to those employed for field tests.

Glass graduates were first used to determine the volume of oil used to fill the density test holes. However, the use of these graduates was not satisfactory because of the possibility of error from the oil adhering to the sides.

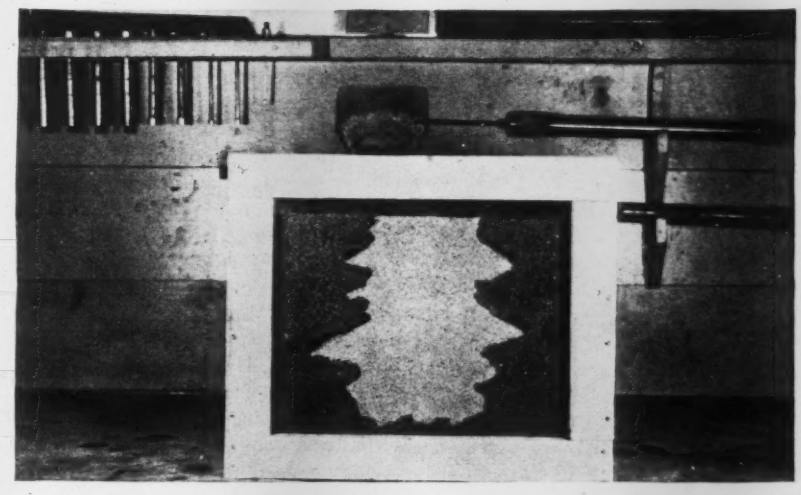
A vertical cylinder volumeter was constructed (see illustration) of 4-in. galvanized pipe equipped with a hollow metal float attached to a stem graduated in thousandths of a cubic foot. A plug of known volume was also used in the holes to reduce the quantity of oil needed and the size of the cylinder. The oil was drained from the volumeter into the test hole after the plug had been placed in the hole, and the volume obtained by adding the volumeter reading and the plug volume.

Later, a volumeter was constructed of transparent plastic tubing (see illustration) with a 4¾-in. dia. by 40-in. height and with ⅜-in. side walls. This tube provided sufficient volume for average test holes, was considerably lighter in weight than the metal pipe, and did not require the use of plugs in test holes. The ends of the tube were capped, the bottom cap being attached to a base equipped with four leveling screw legs and provided with a ¾-in. gate valve.

The tube was machine-graduated in tenths of an inch and was calibrated under a wide range of temperature conditions. Volumes were converted to cubic feet by calibration curves that correct for thermal expansion of the tube and oil film adhering to the side walls. A standard drawdown time of 5 min. was used for the calibrations.

An inexpensive oil-barrel pump was used for reclaiming the oil from the test holes in both laboratory and field tests.

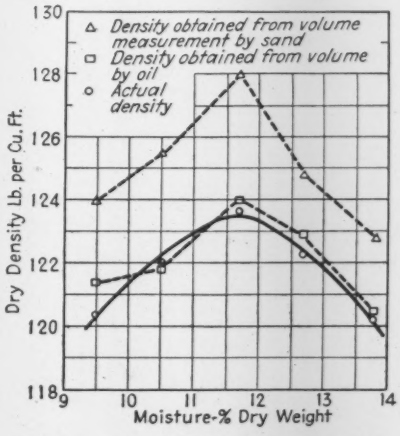
To give an accurate indication of the filling of test holes with oil, a straddle level was built from a carpenter's level with a pin point projecting downward from the center and level with the bottom ends of the device. The oil surface upon touching the pin point instantly forms a meniscus about the point giving a sensitive and accurate method of determining when the test hole is filled.



Density test model with glass plate showing illustrative test hole and sand filling. The dark areas along the upper sides of the recesses indicate the incomplete filling where the angle is flatter than the natural flow slope of the sand.

Laboratory density tests

Numerous density tests were run in the laboratory to study the respective merits of the sand and oil methods of volume determination. Material passing the ¼-in. screen was used because of the limited size of the compaction cylinder, and simulated rock recesses were made in the walls of the test holes to approximate field conditions. Sand for both laboratory and field tests was smaller than a No. 14 screen (1.168 mm.) and larger than a No. 48 screen (.295 mm.)



Typical curves indicating the higher degree of accuracy obtained by using oil measurements as compared to sand.

Briefly, the procedure consisted of the following steps: The material was compacted in the cylinder at the desired density. A hole about 8 in. in diameter by about 1 ft. deep was dug in the compacted material. Material removed from the test hole was weighed and a moisture sample taken. The hole was measured first with calibrated sand and then with oil after the sand had been carefully removed. The respective densities obtained by the use of the sand and oil were then calculated to provide comparative data.

During the fill placement season of 1940, inspection of test holes after removal of the oil showed negligible penetration of the oil into the compacted soil. However, seepage was considered as a possible source of error, but laboratory tests showed that under most conditions the error from seepage was too small to measure accurately, as the only seepage affecting test results was that occuring during the filling of the holes. Entrapped air would tend to compensate any error from seepage, but its volume was too small in the tests made to be susceptible of measurement.

Field density tests

All of the 251 density tests made in the earthfill during the 1940 construction season were measured with oil; 61 of these were measured with both oil and sand methods to provide a check on the laboratory comparison between the two methods.

Procedure used for making the

field density tests was similar to that described for the laboratory tests. The density holes were dug with small hand tools to prevent distortion. After the hole was dug, it was filled with oil and the final scale reading was taken 5 min. after the start of filling the hole. The temperature was noted, and the volume of the test hole was obtained from the scale correction curve for the grade of oil used.

Measurements of test holes using calibrated sand were made in accordance with general practice except that some refinements were attempted in calibrating the sand and in pouring it into the test holes. To determine the weight per cubic foot of the sand, containers of approximately the same size as the test holes were used. A pouring device was used to standardize the method of pouring the sand both into the calibrating container and into the test holes. The device consisted of a funnel with a bottom opening of about 4½ in. in diameter, which was covered by two cross-lapped $\frac{3}{16}$-in. mesh screens to break up and distribute the flow of sand. This eliminated possible variations between the calibration and field test such as height and rate of pour, both of which are more or less common sources of error in volume determination by the sand method.

In the case of holes that were measured by both sand and oil, the sand determination was made first and then the hole was carefully cleaned of sand before the oil measurement was made. After the oil was reclaimed from the holes, inspection was made to observe any penetration of the oil into the soil. In most cases there was no seepage evident.

Accuracy of test results

Density tests made in the laboratory on materials compacted at known densities and using both sand and oil for volume determinations showed that the average errors in density were:

Sand, + 3.8 lb. per cu. ft. or 3.1 per cent higher than actual dry density

Oil, + 0.5 lb. per cu. ft. or 0.4 per cent higher than actual dry density

The averages of 61 field density tests made using both methods showed an even wider variation. Dry densities computed from volumes obtained from sand measurement were 5.4 lb. per cu.ft. higher than those using oil. Of the 61 field tests made using both methods, 37 of the densities obtained by using sand showed values above the curve of complete saturation obtained from specific gravities on individual samples. The corresponding densities on the same tests with oil volume measurements were normal and agreed closely with the standard laboratory compaction densities.

To afford a visual indication of the behavior of sand in a test hole typical of the Green Mountain Dam embankment, a container was constructed having a glass window on one side that would afford a cross-sectional view of a density test model. Material was molded in the container leaving a hole with the glass as one side. Recesses were made in the soil material adjacent to the glass to simulate cavities caused by the removal of rocks in fill tests. Density test sand was poured into the hole in the usual manner and it was observed that voids were left along the tops of the recesses (see illustration) wherever the slope of the overhanging material was less than the natural flow slope of the sand.

Conclusions

Adoption of the oil method for density test hole measurements has resulted in a greater degree of accuracy, more expedient and economical testing at Green Mountain Dam.

Densities obtained from volume measurements by sand have been consistently higher than those using oil, evidently for the simple reason that sand poured loose does not fill the irregularities of the test holes. This results in a smaller than actual volume being computed and consequently a higher density than actually exists. This condition may not be true of other earthfill materials but is probable in materials containing an appreciable amount of ¼-in. to 3-in. or 5-in. rock.

The oil method as used measures volumes directly in cubic feet with small corrections for temperatures. With sand, the volume is measured indirectly and involves calibration of the sand, weighing before and after the test to determine the weight used, and the reduction of weights to volumes by calculation.

Total cost of the oil used for the first 251 field density tests was about $7.20 for the 40 gal. used or about $0.03 per test, which is a negligible amount compared with the cost of screening, and calibrating sand.

Personnel

Field and laboratory tests at Green Mountain Dam, which is a feature of the Colorado-Big Thompson project, are under the direction of R. B. Ward, acting construction engineer, and R. P. Blackwell, chief earthwork inspector. C. H. Howell is supervising engineer for the Colorado-Big Thompson project. All activities of the Bureau of Reclamation are supervised by John C. Page, commissioner, Washington, D. C.; engineering and construction is under the direction of S. O. Harper, chief engineer, with headquarters in Denver.

Sewers in Cold Climates

CANADIAN EXPERIENCE with cold weather indicates that in most cases sewers need not be laid at any great depth. Warmth of the sewage tends to prevent freezing. Sewers need not be laid to the same depth as water mains, which are laid as deep as 7 or 8 ft. A good deal depends on whether the street above the main is much traveled, or whether the snow is removed regularly. An undisturbed covering of snow has a very considerable insulating value, and the depth of the main or sewer can be closer to the surface. Sewers as shallow as 2 ft. in undisturbed land have been found to be free from frost action, but in general a depth of 5 ft. or even more is preferable, and has been more generally accepted.

In the treatment of sewage the effects of cold weather are marked with advantages and disadvantages. On the favorable side may be listed fresher condition of the sewage, and particularly the reduction in odor control and stream pollution. Covering of sewage disposal works is not required merely by the fact that the sewage will freeze, but rather because of certain parts on which ice may form and cause interference. This includes entrance and outlet channels, sludge handling facilities, etc.

This is an abstract of a paper given by A. E. Berry, director, sanitary engineering division, Ontario Department of Health, Toronto, at the recent annual convention of the Federation of Sewage Works Associations.

From Field and Office

Working problems and time-saving methods for engineers and contractors

Tangent Distances for Runway Intersections

In calculating the tangent distances for the intersection of airport runways of different widths, discovery was made of a formula that may be found a time-saver for some kinds of work. An instance is that of running property lines on unequal offsets. In this case a and a' (see diagram) would equal to offset distances and P. I. or R. P. I. may be the intersection of the offset lines. Returning to the runway problem: The diagram indicates the mathematical elements of the pavement intersection.

R = Radius of curve.

w and w' = widths of the pavements from center line to edge.

$a = R + w$ and $a' = R + w'$

T and T' = tangent distances.

Referring to the diagram at the bottom of the column. Then

$$1.\ \frac{\sin A}{a} = \frac{\sin 90^\circ}{H}$$

$$2.\ \frac{\sin A'}{a'} = \frac{\sin 90^\circ}{H}$$

$$3.\ \frac{\sin A}{a} = \frac{\sin A'}{a'}$$

$$4.\ \frac{\sin A'}{a'} = \frac{\sin (B\text{-}A')}{a}$$

$$5.\ \frac{a}{a'} = \frac{\sin (B\text{-}A')}{\sin A} = \frac{\sin B \cos A' - \cos B \sin A'}{\sin A'}$$

$$6.\ \frac{a}{a'} = \sin B \cot A' - \cos B$$

$$7.\ \frac{a}{a'} + \cos B = \sin B \cot A'.$$

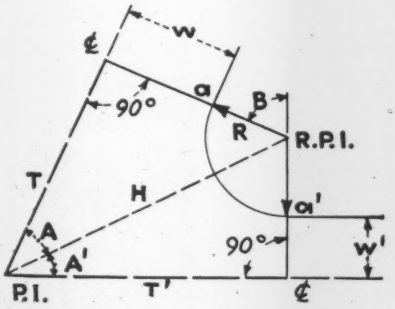


Diagram showing mathematical elements in an airport runway intersection problem.

(Note $\cot A' = \frac{T'}{a'}$)

$$8.\ \frac{T'}{a'} = \frac{\frac{a}{a'} + \cos B}{\sin B}$$

$$9.\ T' = a'\left[\frac{\frac{a}{a'} + \cos B}{\sin B}\right]$$

In (4) let $\frac{\sin A}{a} = \frac{\sin (B\text{-}A)}{a'}$.

This will give (9) as :

$$T = a\left[\frac{\frac{a}{a'} + \cos B}{\sin B}\right]$$

And T and T' are the tangent distances required—JOE L. GRIMES, JR., *Corpus Christi, Tex.*

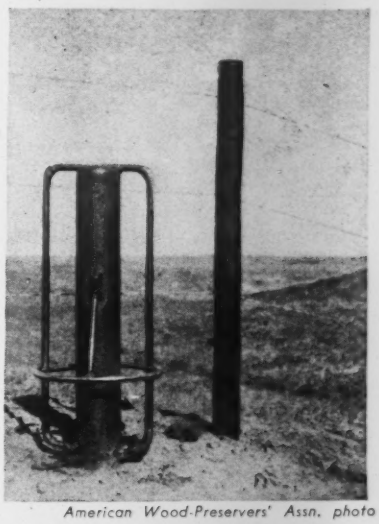
Overhead Signs Warn Traffic Of Construction Ahead

Recently street banners were used by the Louisville, Ky., department of public works to warn traffic that construction was underway ahead. Overhead banners were used on each end of a local project for the removal of streetcar rails and the repaving of one half of the street at a time.

The bright yellow canvas signs with black and red lettering were placed two to three blocks ahead of the job and supported from the wires of a former trolley system. The banners stood up well for the entire job despite rain and wind.

In addition, around the immediate job street barricades of the conventional type were installed to divert traffic into a single lane and to prevent motorists from entering the working areas.—K. N. BANTHIN, *construction engineer, Louisville, Ky.*

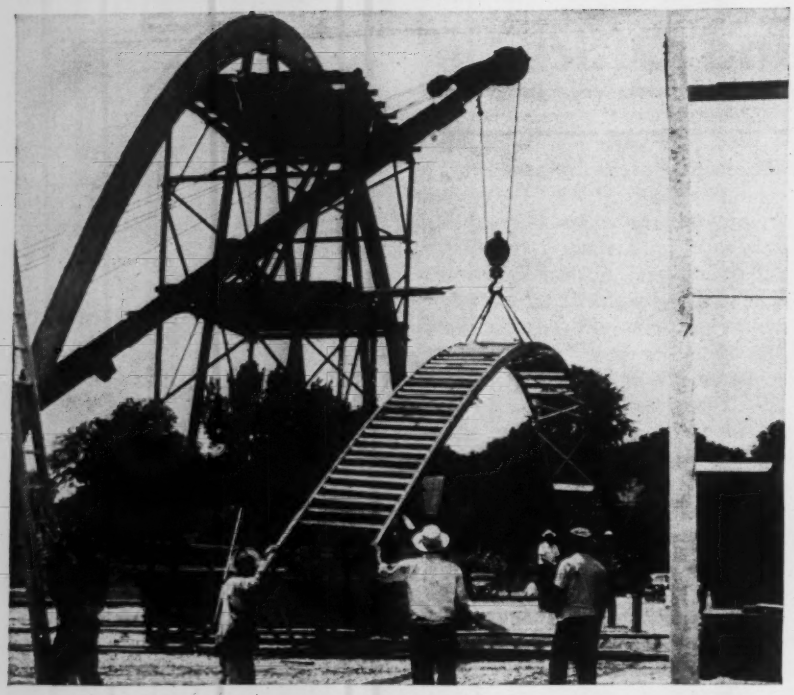
Something new for warning street traffic of construction ahead is the sign above employed at Louisville.



American Wood-Preservers' Assn. photo

TWO-MAN POST DRIVER MAKES FOR SPEED

By use of this 50-lb. welded two-man post driver two men on the Tri-County project in Nebraska drove from 15 to 20 posts per hour of the type shown at the right. The posts are from 2½ to 3 in. in diameter, 6 ft. long, pointed for 8 in. at one end, and driven 2 ft. into the ground. The driver is made from a 32-in. section of 4-in. pipe leaded at the closed end and equipped with two opposite handles.



Donald Sternbergh photos

ROLLER SKATES AID IN ERECTING LAMINATED ARCHES

TO AVOID PRIORITY DELAYS, laminated arches were used for the roof of a building to provide a 15,000-sq.ft. floor area for a roller skating rink in York, Pa. To expedite erection of the arches a light scaffold mounted on roller skates was employed. Left view shows the scaffold in service near the center of the arch, while at the right is illustrated the roller skates in service at each corner of the scaffold, which was moved along on a plank track as work advanced down the length of the building.

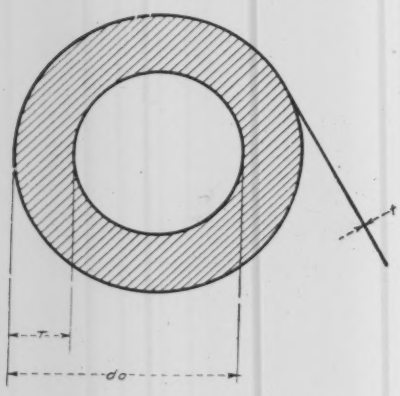
Weight of the arch segments was supported by four nearly vertical 2x2-in. members blocked up on the plank track as illustrated at left. This prevented the weight from crushing the scaffold. The building was built by David Sternbergh.

Yardage in Broken Rolls

The running length of material in broken rolls of tar paper, roofing felt or other building material furnished in tight rolls, may be estimated accurately enough for usual purposes by the formula:

$$L = \frac{\pi\, d_a\, T}{t}$$

In this formula L is the running length, d_a is the average diameter of the annulus of the roll, T is the thickness of the annulus and t is the thickness of one layer of the material. The three measurements for T, d_a and t, to be taken, are shown by the accompanying sketch. If the measurements are taken in inches, L will be in inches. If T and d_a are taken to the nearest hundredth of an inch by an engineer's rule, then t should be taken to the nearest thousandth of an inch by micrometer. If t varies slightly through the material, enough readings should be taken and averaged to give a mean value. The dimension d_a is shown in the sketch by its equal, which is an easily measurable dimension, consisting of the diameter of the inner circumference of the annulus of the material plus the thickness of the annulus.

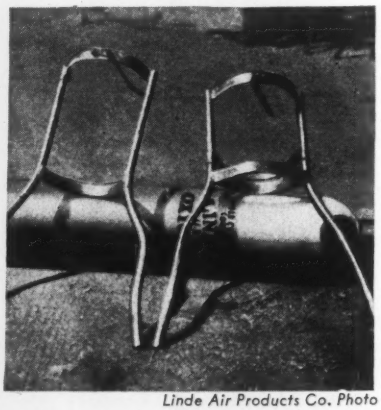


Measurements for estimating fabric in rolls.

Stocktaking of material on hand in partly used rolls, either for final inventory or for estimating the sufficiency of stock available to complete work under way, is greatly facilitated by the formula.—ROBERT J. FLETCHER, *Edgewood, Md.*

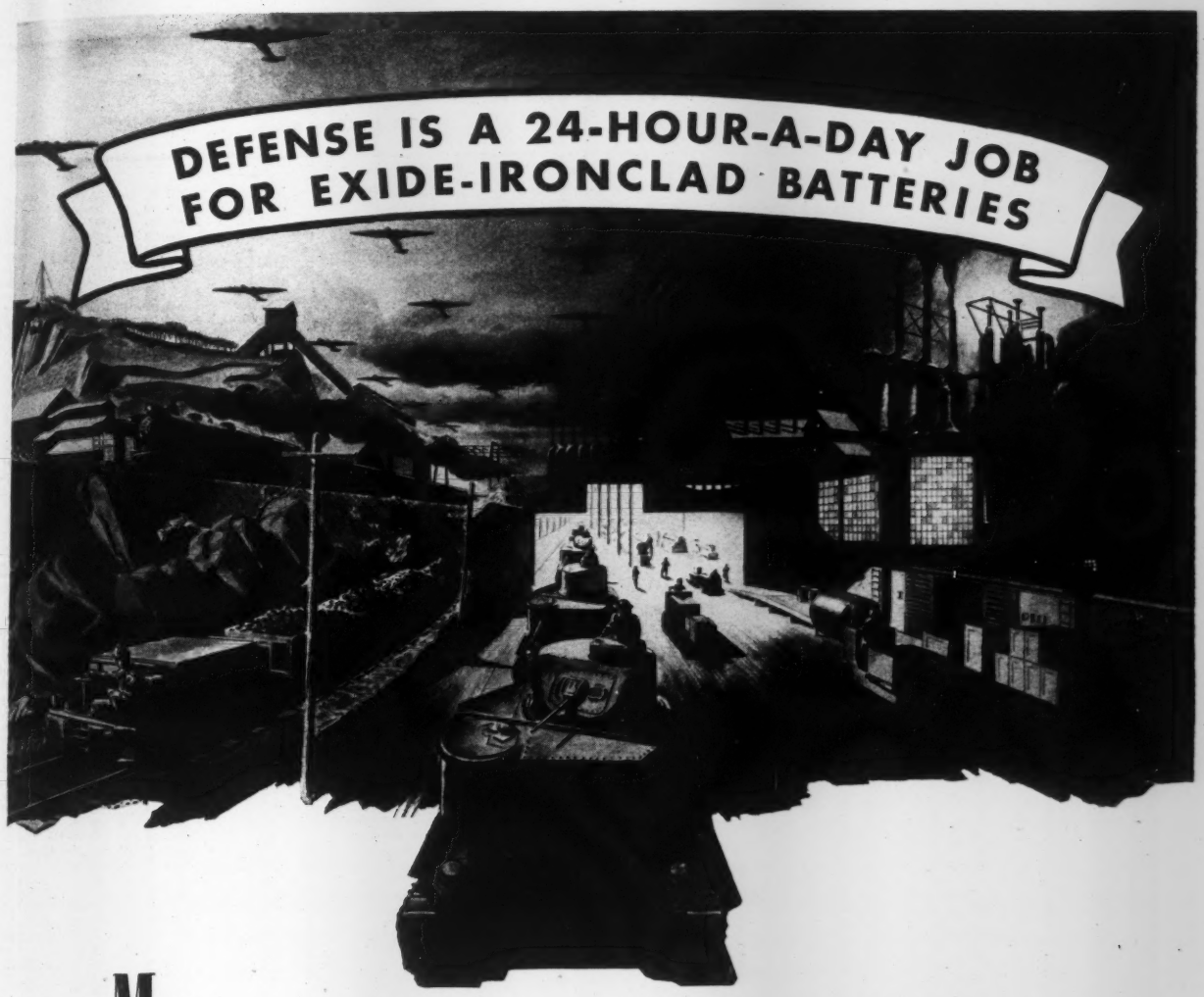
Handles for Oxygen Cylinders

Handles easily made of pipe and strap iron for carrying oxygen or acetylene cylinders on a construction job are shown in the accompanying photograph. The carriers, made quickly by welding, can also be used for handling pipe; for pipes over 6 in. in diameter the carriers are inverted and placed inside.



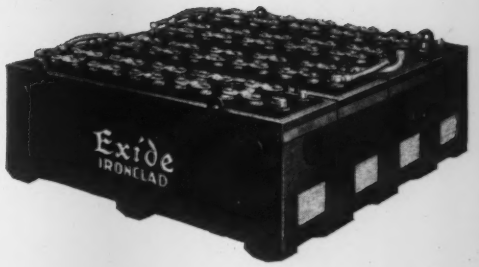
Linde Air Products Co. Photo

Cheaply constructed, these handles make carrying oxygen cylinders easy.



MORE TONS of coal, more tons of minerals... by the thousands... are needed. They must be mined and hauled *faster* to keep defense furnaces roaring and defense machinery moving.

So Exide-Ironclad Batteries are on the job night and day, powering the storage battery locomotives and shuttle cars in mines, quarries and tunnels.



Exide-Ironclads have been specified for this important 24-hour-a-day defense job because they supply the surging power needed to handle today's heavier loads . . . and they deliver this power at a consistently high voltage for faster running speeds.

Best of all, Exide-Ironclad Batteries are so easy to maintain and so *dependable* that they are helping to prevent breakdowns and delays... they're doing their part to keep America rolling!

Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

FILTRATION PLANT, TRANSMISSION MAINS, NEWPORT NEWS, VA.

OWNER: Newport News Waterworks Commission, Newport News, Va., in conjunction Defense Public Works, Federal Works Agency, Reeves Newsom, Newsom & Aldrich, consulting engineer.

PROJECT: Construction of filtration plant, 6,000,000 gallon-per-day capacity, at Harwood's Mill in York County, Va., and transmission mains from plant to Newport News and Hampton. Includes about 42,600 feet of 30-in. cast iron pipe; 24,000 ft. of 20-in. cast iron pipe; 15,300 ft. 16-in. pipe, and 6,000 ft. of 12-in. pipe; all excavation; concrete and brick masonry; valves and appurtenances; superstructures; filter equipment; pumping equipment; and appurtenant work. Project has priority rating of A-3, and was first of the DPW projects to be set up and progress through various branches of the Federal Works Agency and through the Division of Priorities of the OPM. City received $803,600 allotment from DPW.

CONDITIONS: Contractor to furnish all materials and complete work by May 15, 1942. Rail, highway and transportation facilities available. Minimum wage rates approved are: skilled labor, $1.00 to $1.50; semi-skilled, 50 to 75c.; and common labor, 40 to 50c. per hr. Alternates were allowed on the 30-in. pipe, either concrete or cast iron; lower bid was for cast iron pipe. Another alternate which permitted construction of a wash water standpipe, or a wash water elevated tank with the cathodic or electrolytic method of protection, found the former to be lower.

BIDS: Six bids were received November 5, 1941, ranging from the contract low of $988,689 to $1,210,955. Engineer's estimate, $1,060,420.

LIST OF BIDDERS:

(Based on 30-in. c.i. pipe and wash water standpipe).

1. Bass Engr. & Constr. Co., Detroit, Mich. (contract) $988,689
2. Tuller Constr. Co., Red Bank, N. J. 1,030,370
3. A. H. Guion & Co., Inc., Charlotte, N. C. 1,040,075
4. Virginia Engr. Co., Newport News, Va. 1,079,492
5. John Felmley Co., Bloomington, Ill. 1,091,705
6. Woodcrest & Rosoff Bros. Constr. Co., New York, N. Y. 1,210,955

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation and disposal	15,000 c. y.	$2.50	$3.00	$1.45
2. Timber piles	500 l. f.	2.50	.80	1.50
3. Concrete (fndn. and gr. floor)	650 c. y.	35.00	30.00	17.70
4. Concrete (walls)	1,250 c. y.	35.00	36.00	30.00
5. Concrete (slabs, beams, etc.)	600 c. y.	35.00	38.00	35.00
6. Concrete (not reinforced)	100 c. y.	30.00	18.00	17.00
7. Steel reinforcement	130,000 lb.	.07	.10	.06
8. Cast iron pipe, b. & s.	175 ton	88.00	120.00	105.00
9. Cast iron specials, b. & s.	35 ton	250.00	210.00	220.00
10. Cast iron specials, flanged	40 ton	300.00	260.00	275.00
11. 24-in. gate, flanged end, hydraul. cylind.	4 ea.	625.00	800.00	750.00
12. 24-in. gate, fl. end., hydr. cyl. special.	4 ea.	750.00	800.00	900.00
13. 20-in. gate valve, hub end, with box.	1 ea.	250.00	300.00	258.00
14. 16-in. gate valve, fl. end, hyd. cyl.	4 ea.	275.00	325.00	325.00
15. 16-in. gate, hub end, bevel gear, with box	3 ea.	300.00	350.00	314.00
16. 12-in. gate, fl. end, hyd. cyl	4 ea.	200.00	200.00	200.00
17. 12-in. gate, fl. end, with wheel	2 ea.	90.00	100.00	92.00
18. 12-in. gate, hub end, with box	3 ea.	90.00	100.00	83.00
19. 12-in. gate, hub end, with box	1 ea.	120.00	125.00	117.00
20. 10-in. gate, fl. end, with wheel	1 ea.	75.00	80.00	75.00
21. 8-in. gate, hub end, with box	1 ea.	50.00	60.00	52.00
22. 6-in. gate, fl. end, with wheel	6 ea.	40.00	45.00	48.00
23. 6-in. gate, hub end, with box	2 ea.	45.00	45.00	39.00
24. 4-in. gate, fl. end, with wheel	5 ea.	25.00	30.00	33.00
25. 4-in. gate, fl. end, with wheel	2 ea.	22.00	25.00	27.00
26. 24-in. check valve, hub end	1 ea.	800.00	800.00	850.00
27. 12-in. check valve, fl. end	2 ea.	225.00	250.00	308.00
28. 10-in. check valve, fl. end	1 ea.	175.00	170.00	256.00
29. 4-in. check valve, fl. end	2 ea.	50.00	60.00	92.00
30. 10-in. cone valve, fl. end	1 ea.	2,000.00	1,600.00	1,672.00
31. 8-in. cone valve, fl. end	2 ea.	1,350.00	1,400.00	1,370.00
32. 16-in. sluice gate, fl. end., with stand.	7 ea.	250.00	400.00	215.00
33. 12-in. pressure relief valve, fl. end.	1 ea.	900.00	1,000.00	1,095.00
34. 20-in. float valve, fl. end	1 ea.	1,000.00	2,000.00	2,185.00
35. 6-in. flap valve, fl. end	4 ea.	20.00	25.00	38.00
36. 4-in. plug valve, spigot end	1 ea.	40.00	65.00	46.00
37. 6-in. soil pipe drain and sewer	100 l. f.	2.50	.80	1.00
38. 6-in. vitr. tile, open joints	500 l. f.	.75	.60	1.00
39. 6-in. vitr. tile sewer and drain	300 l. f.	.50	.50	.50
40. Intake bulkhead	L. S.	1,000.00	500.00	450.00
41. Intake water screen	L. S.	4,500.00	5,600.00	4,306.00
42. Aerator tower	L. S.	3,500.00	6,000.00	5,260.00
43. Flocculators	L. S.	3,500.00	4,500.00	3,644.00
44. Filter underdrainage system	4 ea.	2,000.00	3,000.00	2,378.00
45. Filter gravel	120 c. y.	10.50	12.00	17.00
46. Filter sand	200 c. y.	10.00	9.00	13.00
47. Wash water gutters	4 ea.	900.00	2,500.00	2,163.00
48. Operating tables	4 ea.	700.00	1,100.00	1,118.00
49. Sample table	1 ea.	700.00	1,000.00	1,056.00
50. Controllers and gages	4 units	2,000.00	3,000.00	2,670.00
51. Water level gages	L. S.	1,250.00	2,600.00	1,922.00
52. Telemeter gage	L. S.	225.00	300.00	709.00
53. 24-in. discharge meter	1 ea.	1,750.00	1,800.00	2,321.00
54. 24-in. wash water meter	1 ea.	1,750.00	1,900.00	2,384.00
55. 6-in. meters	L. S.	800.00	500.00	1,218.00
56. Dry feed machine	L. S.	2,000.00	4,000.00	4,080.00
57. Chlorinators and ammoniators	L. S.	5,500.00	8,000.00	7,256.00
58. Superstructure	L. S.	27,100.00	33,000.00	35,000.00
59. Heating and ventilating	L. S.	5,000.00	7,500.00	8,850.00
60. Electric lighting	L. S.	14,500.00	18,000.00	9,165.00
61. Plumbing	L. S.	2,500.00	2,000.00	1,900.00
62. Pump, 2,200 gpm., 30-ft. head	1 ea.	800.00	1,100.00	939.00
63. Pump, 2,900 gpm., 30-ft. head	1 ea.	1,100.00	1,400.00	1,222.00
64. Pump, 4,400 gpm., 30-ft. head	1 ea.	1,750.00	2,300.00	2,026.00
65. Pump, 2,100 gpm., 190-ft. head	1 ea.	2,200.00	2,800.00	2,592.00
66. Pump, 2,800 gpm., 200-ft. head	1 ea.	2,600.00	3,400.00	3,083.00
67. Pump, 4,200 gpm., 205-ft. head	1 ea.	3,600.00	4,200.00	4,167.00
68. Pump, 400 gpm., 60-ft. head	2 ea.	410.00	500.00	485.00
69. Wet vacuum pump	L. S.	430.00	550.00	335.00
70. High pressure pump	L. S.	650.00	750.00	460.00
71. Switchboard and equipment	L. S.	15,000.00	25,000.00	21,148.00
72. Misc. cast iron, wr. iron and steel	L. S.	2,100.00	4,000.00	4,485.00
73. Railings	L. S.	2,800.00	3,500.00	3,322.00
74. Flush hydrant	2 ea.	60.00	110.00	117.00
75. Fire hydrant	1 ea.	100.00	125.00	126.00
76. Wash water standpipe	L. S.	5,995.00	7,500.00	6,050.00
77. Wash water elev. tank (alternate)	L. S.	7,660.00	9,500.00	8,040.00
78. Cathodic protection (alternate)	L. S.	340.00	400.00	400.00
79. Laboratory equipment	L. S.	2,500.00	2,500.00	2,500.00
80. Miscellaneous equipment	L. S.	500.00	500.00	500.00
81. Manholes and catch basins	L. S.	1,000.00	2,000.00	890.00
82. Roads and walks	L. S.	760.00	1,000.00	1,350.00
83. Grassing and seeding	L. S.	600.00	1,500.00	500.00
84. Operators residence	3 ea.	4,250.00	6,000.00	4,200.00
85. Furnish 30-in. cast iron pipe	42,500 l. f.	7.25	6.78	6.88
86. Furnish 20-in. cast iron pipe	23,900 l. f.	4.75	4.42	4.50
87. Furnish 16-in. cast iron pipe	15,200 l. f.	3.50	3.20	3.21
88. Furnish 12-in. cast iron pipe	5,900 l. f.	2.25	2.10	2.10
89. Furnish 30-in. cast iron specials	50 ton	130.00	125.00	137.00
90. Furn. 24-in. and under c. i. spec	50 ton	110.00	120.00	115.00
91. Laying 30-in. cast iron pipe	42,600 l. f.	1.25	1.40	2.40
92. Laying 20-in. cast iron pipe	24,000 l. f.	1.10	1.00	1.87
93. Laying 16-in. cast iron pipe	15,300 l. f.	1.00	.87	1.35
94. Laying 12-in. cast iron pipe	6,000 l. f.	.90	.88	1.00
95. Furn. and laying 30-in. concrete pipe (alternate)	42,600 l. f.	8.64	8.25	9.90
96. Rock excavation	100 c. y.	10.00	.01	.300
97. Excess depth excavation	500 c. y.	.50	.25	1.50
98. Replace macadam pavement	500 s. y.	1.50	2.00	2.00
99. Replace concrete pavement	200 s. y.	3.00	5.00	5.00
100. Replace concrete sidewalks	100 s. y.	1.50	2.00	2.00
101. Railroad crossings	L. S.	3,500.00	1,500.00	750.00
102. Conc. pile supports (bents)	100 ea.	135.00	130.00	130.00
103. 20-in. gates and chambers	18 ea.	500.00	475.00	560.00
104. 16-in. gates and chambers	6 ea.	400.00	350.00	430.00
105. 12-in. gates and boxes	6 ea.	120.00	98.00	130.00
106. 8-in. gates and boxes	12 ea.	60.00	46.00	60.00
107. 6-in. gates and boxes	30 ea.	40.00	32.00	40.00

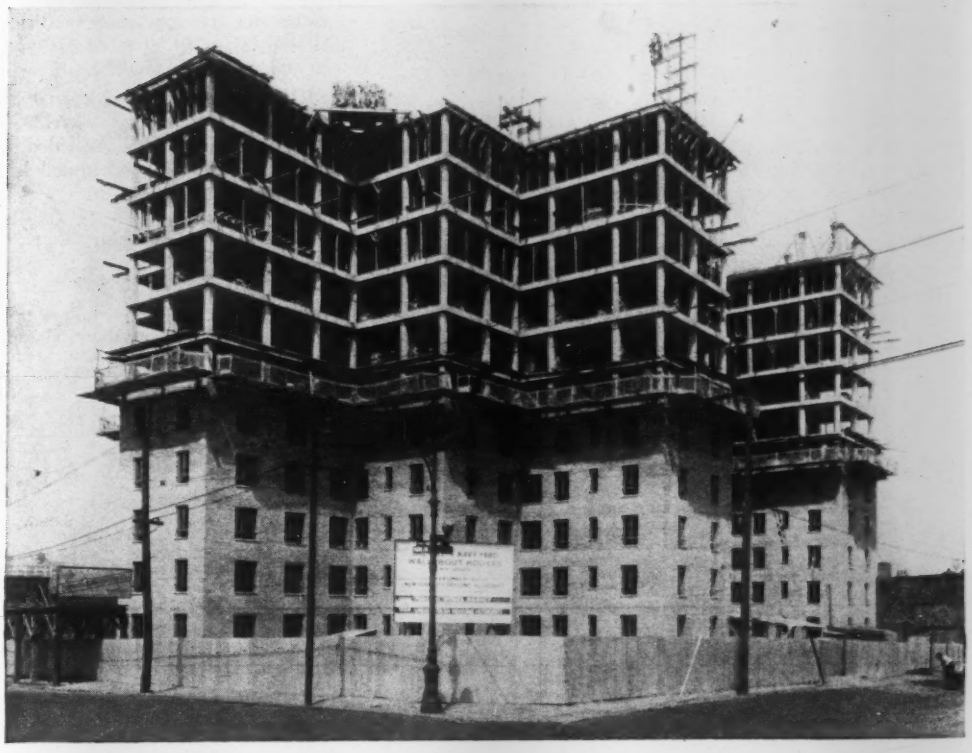
DIVERSION AND OUTLET TUNNEL FOR GRANBY DAM, COLORADO

OWNER: Bureau of Reclamation, Denver, Colo.; S. O. Harper, chief engineer.

PROJECT: Construction of diversion and outlet tunnel at Granby Dam, Colorado-Big Thompson project, Colorado, including open-cut excavation for approaches to inlet and outlet ends of tunnel, open-cut excavation above El. 5154 for trash-rack structure at top of inlet shaft to outlet tunnel, open cut excavation to solid rock at top of elevator shaft above gate chamber, and construction of diversion and outlet tunnel, the inlet shaft to El. 8154, and elevator shaft to rock line at El. 8240 for outlet works. Located on Colorado River about five miles northeast of Granby, Colo.

(*Continued on page* 100)

CONCRETED IN 37 WORKING DAYS



HIGH-SPEED WITH 'INCOR' ON THIS 13-STORY NAVY HOUSING PROJECT

QUALITY PAYS... INSIST ON LONE STAR AND 'INCOR'

THIS 13-story reinforced-concrete apartment building, 11,500 sq. ft. per floor, was erected in 37 working days—2 floors a week. Noteworthy speed on New York City's first defense housing project, for enlisted Navy personnel, near Brooklyn Navy Yard. Outstanding value, too—completed fire-safe structure, ready for occupancy, at about 40¢ a cu. ft.

Using 'Incor' 24-Hour Cement, ready-mixed concrete was poured at night, avoiding traffic congestion. Next morning, carpenters were on the freshly-placed floors. With 125 columns per floor, erection was by no means simple. *But good job planning with 'Incor' saved 2 work weeks.* 'Incor's excellent workability produced clean surfaces for exposed ceilings and floors.

Get speed like this the year around . . . use 'Incor'* this Winter . . . save 2 to 3 days' heat protection on each pour . . . cut form costs in half . . . high speed with economy. Write for copy of "Cold-Weather Concreting." Lone Star Cement Corporation, Room 2279, 342 Madison Avenue, New York. *Reg. U. S. Pat. Off.

Brooklyn Navy Yard Wallabout Houses: New York City Housing Authority, for U. S. Housing Authority. Architect: Hohauser, Vollmer & Wefferling, New York. Contractor: Corbetta Construction Co., New York.

LONE STAR CEMENT CORPORATION

Offices: ALBANY • BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON • INDIANAPOLIS • KANSAS CITY • NEW ORLEANS • NEW YORK • NORFOLK • PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

(*Continued from page* 98)

CONDITIONS: Government to furnish cement; admixtures; reinforcement bars; concrete or clay sewer pipe for drains; pipe and fittings for grout connections; metal sealing strips and welding rods; metal ladder rungs, metal inserts for guide rail brackets; anchor bolts; pipe for placing concrete in diversion bypass conduit; and various other materials that will become part of completed construction. Access from existing roads to be provided by contractor. Railroad transportation available to Granby. Time for completion 225 calendar days. Wage rates are: skilled labor, $1.10 to $1.50 per hr.; semi-skilled, 70c. to $1.10; and common, 62½ to 72½c.

BIDS: Four bids were opened October 20, 1941, ranging from the contract low of $283,180 to $373,575. Awarded November 1, 1941.

LIST OF BIDDERS:

1. Platt Rogers, Inc., Pueblo, Colo. (contract) $283,180
2. Ed. H. Honnen Constr. Co., Colorado Springs, Colo. ... 317,870
3. Pioneer Constr. & Engr. Corp., and Dale Hinman, Denver, Colo. 342,975
4. S. S. Magoffin Co., Inc., Englewood, Colo. 373,575

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excav., strip sand and gravel deposit	1,500 c. y.	$1.00	$0.30	$0.30
2. Excavation, common, in open cut	15,000 c. y.	1.00	1.55	2.35
3. Excavation, rock, in open cut	7,000 c. y.	2.00	1.55	2.35
4. Excav., all classes, tunnel and shafts	7,800 c. y.	15.00	18.00	19.00
5. Furn. and place perm. str. steel tunnel supports	20,000 lb.	.10	.12	.15
6. Furn. and place steel tunnel-liner plates and steel lagging	40,000 lb.	.12	.11	.15
7. Cobble-and-rock fill on downstream slope of dam embank.	22,000 c. y.	.50	.50	.30
8. 4-in. sewer pipe drain, uncem. jts., embedded in porous conc.	200 l. f.	2.00	2.60	3.00
9. Porous conc. in horizontal bands around elevator shaft	17 c. y.	40.00	20.00	50.00
10. Drilling weep holes	600 l. f.	.75	1.50	1.00
11. Drill 1¾-in. grout holes, to 10-ft	1,000 l. f.	.75	1.50	3.00
12. Place grout pipe and fittings	1,500 lb.	.50	.10	.25
13. Pressure grouting	3,000 c. f.	1.00	1.50	1.25
14. Concrete in tunnel lining	2,400 c. y.	30.00	32.00	30.00
15. Conc. in shaft, gate-chamber and tunnel-plug lining	700 c. y.	35.00	35.00	45.00
16. Cone ir tunnel inlet and outlet struct	300 c. y.	35.00	35.00	25.00
17. Placing reinforcement bars	200,000 lb.	.02	.025	.03
18. Place metal sealing strips	200 l. f.	.50	1.30	2.00
19. Install miscellaneous metal work	1,500 lb.	.50	.10	.30

MILL CREEK PUMPING STATION
CINCINNATI, OHIO

OWNER: U. S. Engineer Office, Cincinnati, Ohio. Lt. Col. Fred T. Bass, district engineer.

PROJECT: Construction of brick and concrete pump station, 90 by 270-ft., on Mill Creek in Cincinnati, Ohio. Work involves conduits for electric wiring; discharge bay; abutment; fender wall; concrete walls (reinforced) of various sizes; concrete flood walls, earth embankment and ramps; movable gate closures; sewers; reinforcing and removal of portions of existing sewers; and other appurtenant work. This is largest pump plant ever built. To house six pump units, each with 1,500 c.f.s. capacity for a 29-ft. head. Space is allowed for three additional pump installations if future needs require.

CONDITIONS: Contractor to furnish all materials except pumps, motors and their accessories, and complete work in 700 calendar days. Project to be built on concrete piling. Alternates were allowed on precast or cast-in-place piling, the contract award being made on former basis. Specifications contained "escalator clause" which stated that adjustments in bid prices would be made if material and labor prices changed. Bureau of Labor Statistics data on prices and labor rates to be basis of measurement. Adjustments to be based on labor being 32 percent of cost and materials 38 percent. Low bidder's figure based on inclusion of "escalator clause"; third low substituted a clause which states that if any difference in wage rates listed in specifications and those actually paid exists during the life of the contract, the government is to reimburse the contractor monthly for the actual difference. Variations in material prices to be adjusted on similar basis. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.50 to $1.62½ per hr.; semi-skilled, $1.00 to $1.40; and common, 75c.

BIDS: Six bids were received September 30, 1941, ranging from the contract low of $2,439,642 to $2,720,189. Engineer's estimate, $2,422,146. Awarded October 6, 1941. All bids rejected on opening scheduled July 29, 1941.

LIST OF BIDDERS:

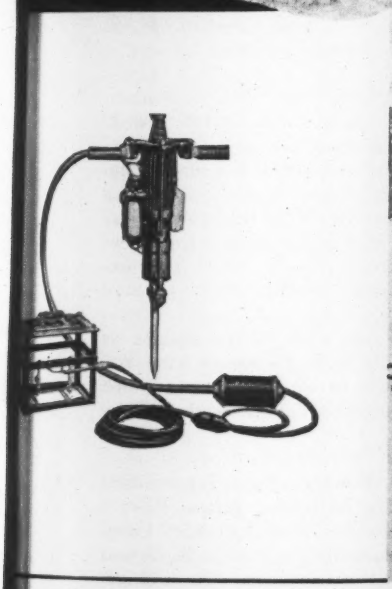
1. Ferd J. Robers Constr. Co., Burlington, Wis., and LaCrosse Dredging Corp., Minneapolis, Minn. (contract) $2,439,642
2. Patton-Tully Transportation Co., and Badgett Constr. Co., Memphis, Tenn. 2,483,141
3. Spencer, White & Prentis, Inc., New York, N. Y. (substituted escalator clause) 2,593,689
4. Fegles Constr. Co., Ltd., Minneapolis, Minn., and United Constr. Co., Winona, Minn. 2,685,690
5. Ferro Concrete Constr. Co., Cincinnati, Ohio 2,698,421
6. Spencer, White & Prentis, Inc., New York, N. Y. (escalator clause omitted) 2,720,189

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Diversion, care of stream, unwater found	L. S.	$250,000.00	$250,000.00	$310,000.00
2. Clear, grub, and remove structures	L. S.	9,000.00	27,500.00	15,000.00
3. Excavation	265,000 c. y.	.60	.90	1.00
4. Excav. in borrow areas	7,000 c. y.	.50	.90	1.00
5. Embankment	21,000 c. y.	.50	.15	.25
6. Seeding	1 ac.	100.00	300.00	400.00
7. Fertilizer	0.5 ton	100.00	100.00	100.00
8. Compacted backfill	85,000 c. y.	.75	.40	.50
9. Sand and gravel filters and drains	14,900 c. y.	2.00	2.50	2.70
10. Collector drain, 6-in	200 l. f.	1.00	2.00	2.00
11. Collector drain, 12-in	170 l. f.	2.50	2.75	4.00
12. Pipe drain, 12-in	315 l. f.	2.00	2.75	3.00
13. Remove Mill Creek intercept. sewer	660 l. f.	18.00	15.00	20.00
14. Dumped riprap	13,600 c. y.	5.00	6.00	7.00
15. Derrick stone	1,400 c. y.	7.00	10.00	12.00
16. Class B concrete	2,000 c. y.	30.00	40.00	35.00
17. Class C concrete	43,000 c. y.	21.30	19.00	19.00
18. Reinforcing steel	4,400,000 lb.	.055	.06	.05
19. Structural steel	950,000 lb.	.12	.12	.10
20. Precast conc. piles (vertical)	18,500 l. f.	2.70	2.75	2.50
21. Precast conc. piles (battered)	73,500 l. f.	3.00	2.75	3.00
22. Cut off precast conc. piles	1,800 ea.	7.00	4.00	5.00
23. Steel sheet piling (23# per s. f. of wall) vertical	21,200 s. f.	1.50	1.50	2.00
24. Steel sheet piling (battered, 27# per s. f. of wall	9,600 s. f.	2.00	2.15	3.00
25. Pump sta. superstr. above El. 512, incl. brick veneer on walls and pilasters below El. 512, except as noted	L. S.	54,000.00	55,000.00	67,000.00
26. Bulkhead storage cars	6 ea.	150.00	1,300.00	1,000.00
27. Overhead traveling crane	L. S.	19,000.00	11,000.00	20,000.00
28. Motor drying system	L. S.	1,750.00	4,300.00	4,000.00
29. Steel conduit, 1¼-in. dia	1,200 l. f.	.60	.60	.50
30. Steel conduit, 1½-in. dia	900 l. f.	.60	.75	.60
31. Steel conduit, 2-in. dia	4,200 l. f.	1.00	1.05	1.00
32. Steel conduit, 3-in. dia	650 l. f.	1.20	1.75	1.50
33. Steel conduit, 3½-in. dia	700 l. f.	1.20	2.15	2.00
34. Steel conduit, 4-in. dia	275 l. f.	2.00	2.75	2.60
35. Steel conduit, 4½-in. dia	120 l. f.	2.50	3.40	3.00
36. Conduit fittings for convenience receptacles, wall switches, lighting fixtures	150 ea.	1.20	5.00	5.00
37. Fiber conduit	450 l. f.	1.20	1.25	1.00
38. Inst. equipt. to be furn. by Govt.	900 ton	45.00	60.00	70.00
39. Hand rail, 1½-in., welded	20 l. f.	2.00	3.00	5.00
40. Hand rail, 2-in., ball pattern	950 l. f.	2.50	4.50	6.00
41. Hand rail, 1½-in., ball pattern	620 l. f.	2.00	3.00	5.00
42. Miscellaneous metals	66,000 lb.	.15	.15	.20
43. Gravel surfacing	900 s. y.	1.00	2.00	2.00
44. Track, fittings, ballast (storage yd.)	112 tr. ft.	3.50	5.00	7.00
45. Track, fittings, ballast (spur track)	330 tr. ft.	4.50	5.00	10.00
46. Rails and fittings (overhd. crane)	520 rail ft.	2.00	4.00	3.60
47. Rails and fittings (rake and transf. platform)	1,360 rail ft.	1.50	3.00	3.50
48. Oak timber	10,000 ft. bm.	.15	.15	.30
49. Fencing, complete	180 l. f.	2.00	3.00	8.00
50. Cast steel	400 lb.	.25	.30	.50
51. Cast iron	3,000 lb.	.10	.10	.10
52. Bronze	1,850 lb.	.50	.60	.50
53. Grating, 1x⅜-in.	30 s. f.	1.50	2.50	3.00
54. Grating, 1½x⅜-in.	1,670 s. f.	2.00	3.50	4.00
55. Grating, 1¾x⅜-in.	430 s. f.	2.00	4.50	5.00
56. Grating, 2¾x⅜-in.	530 s. f.	3.00	5.50	6.00
57. Grating, 4x⅜-in.	275 s. f.	3.00	6.50	7.00
58. Piezometer piping, complete	L. S.	1,200.00	2,500.00	3,500.00
59. Misc. piping and plumbing for pump sta. below El. 512	L. S.	1,200.00	3,000.00	4,000.00
60. Doors and frames below El. 512	4 ea.	150.00	75.00	100.00
61. *Cast-in-place conc. piles (vertical)	18,500 l. f.	3.70	No. bid	4.50
62. *Cast-in-place conc. piles (battered)	73,500 l. f.	3.70	No bid	4.50
63. *Cut off cast-in-place piles	1,800 ea.	1.00	No bid	2.00

*Alternates for items 20, 21 and 22.

BARCO OWNERS ARE

Ready for Winter's Worst



PORTABLE BARCO HAMMERS ARE THE ANSWER TO SNOW-BLOCKED ROADS AND COLD WEATHER WORK

● When Winter at its worst threatens to tie busy schedules into knots, users of BARCO Hammers have a distinct advantage. With one or more of these REALLY PORTABLE hammers on hand, contruction crews can get to jobs that couldn't be reached with heavier, bulkier equipment. Once ON the job, these hard-hitting tools are equal TO the job. They're powered to break through rock-hard frost, concrete or rock with remarkable speed.

Low in first cost and inexpensive to operate, BARCO Hammers are a "must" for contractors who want to turn out work at lowest cost, Winter and Summer, rain or shine. Look into this "all-weather" tool at once. Write to arrange a job demonstration.

BARCO MANUFACTURING CO., *Not Inc.*
1814 Winnemac Avenue, Chicago, Ill.

BARCO *Portable* GASOLINE HAMMER

Dedicated to Pro... THE AMERICAN WAY OF LIFE

POWER SAWS
FEED GRINDERS
SAND SPREADERS
THESE ARE BUT A FEW OF THE WIDE RANGE OF APPLICATIONS OF BRIGGS & STRATTON MOTORS
Service Men—
Report That Briggs & Stratton Motors Deliver Unprecedented Performance Under All Conditions
Service men who really know what happens to power equipment "on the job" report that Briggs & Stratton motors are "tops" in motor performance. They have proven themselves unusually economical under all operating conditions—perform year after year with little or no maintenance expense—are enthusiastically endorsed by owners and users alike. This is another reason why Briggs & Stratton air-cooled motors are the choice of hundreds of manufacturers of machines, tools and appliances using gasoline power from 2/3 to 6 H.P.
BRIGGS & STRATTON CORP., Milwaukee, Wis., U.S.A.
4 CYCLE
BRIGGS & STRATTON
GASOLINE MOTORS

MEN AND JOBS

John M. Naughton has been appointed WPA administrator for the state of Iowa, and his commission confirmed by the U. S. Senate.

Pennsylvania's Highway Department has announced the appointment of **Charles G. Kleckner,** of Lock Haven, Pa., as project engineer assigned to District No. 8, with headquarters at Harrisburg.

Charles N. Barnum, naval architect currently employed as communications engineer by the Wisconsin Telephone Co., Milwaukee, is reporting for active duty at Manitowoc, Wis., as a lieutenant with the construction corps of the naval reserve.

Col. DeWitt C. Jones has been assigned to the position of assistant to the Lower Mississippi Valley Division engineer at Vicksburg, Miss., with additional duty as assistant to the president of the Mississippi River Commission.

Louis Barefanger, of Salem, Ill., retains the title of superintendent of highways in Marion County, Ill. although he is now in the Army, and **E. E. Bruce** is acting for him in the meantime.

Capt. F. O. Stenger has taken over at Milan, Tenn., the duties of executive construction officer of the Wolf Creek Ordnance plant.

Col. Jarvis Bain, Second Army engineer, has replaced **Col. James D. Andrews, Jr.,** as district engineer for the U. S. Engineers' Memphis district.

Leslie B. Smith, city WPA superintendent at Ashtabula, Ohio, for the last 32 months, has resigned to become construction engineer at the Ashtabula shipyard of the Great Lakes engineering works. **Harry C. King** of Jefferson has succeeded Mr. Smith as superintendent of the city-wide WPA street improvement program.

Floyd Ellis has resumed his position as Knox County (Ohio) engineer after two months' leave of absence during which he was engaged in defense work in Pittsburgh.

Edward M. Proctor, of the Toronto firm of consulting engineers, James, Proctor and Redfern, has been appointed Canadian representative to the U. S. bureau of industrial conservation. He will act as liaison officer between the bureau and the Canadian Ministry of Munitions and Supply.

Frank W. Mead, formerly contractor, of Westchester County, New York, is now with the contractors for the Pacific naval air bases in the office of J. H. Pomeroy & Co., Inc., 333 Montgomery St., San Francisco, Calif., in charge of personnel.

Harvey B. Armour, Iowa WPA operations division director, has been named regional WPA engineer, with headquarters in St. Paul.

John Jacobs, formerly of Milbank, S. D., and more recently of the engineering staff of the South Dakota state highway department, has been transferred to Harrisburg, Pa., as supervising engineer under the Public Roads Administration. He has been stationed at Ridge, S. D., for the past two years in charge of federal highway projects.

Maj. W. O. Hauck, chief engineer and assistant constructing quartermaster at the Hoosier Ordnance Works (bag plant), left late in November to take charge of construction at a new defense project, probably the $53,000,000 Wabash Ordnance Works near Clinton, Ind.

Capt. William C. Campbell, constructing quartermaster at Fort Leonard Wood since September, is assigned similar duties for the Ozark Ordnance Works, at El Dorado, Ark.

Carlos D. Bullock has resigned from the Federal Works Agency in Washington, D. C., to accept a position as structural engineer for the Portland Cement Association, with headquarters in Philadelphia, Pa. Mr. Bullock was formerly with the Tennessee Valley Authority in the engineering design division, and is a graduate of the University of Nebraska.

Herbert Fritz, former Burlington, Iowa, school maintenance engineer, has resigned to become associate engineer to the U. S. Army constructing quartermaster, seventh zone, with headquarters in Omaha.

Harland Bartholomew, St. Louis city plan engineer, has been appointed to the Missouri State Planning Board by Governor Forrest C. Donnell. He has been engaged in city planning in St. Louis for the past 25 years.

L. E. Tyson, Nebraska state airport engineer, has been ordered to the Army Air Corps gunnery school at Las Vegas, Nev. He holds a reserve commission as first lieutenant.

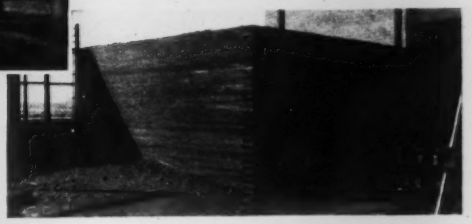
M. T. Ulteig, chief engineer of the North Dakota Public Service Commission, who

(*Continued on p.* 106)

Untreated lumber lasted only 3 years here. This Wolmanized decking is sound after 6 years of hard service. →

7 years old, the Wolmanized Lumber in this passenger station umbrella is ← in good condition today.

8 years old, this Wolmanized Lumber coal bin hasn't cost a cent for maintenance. →



Service Records

PROVE WOLMANIZED LUMBER* HAS PLENTY OF *Plus*

"Show no favoritism!" With these instructions, investigators went into industry's "tough" spots for the low-down on performance of Wolmanized Lumber.

SERVICE RECORDS ARE AVAILABLE ON THESE APPLICATIONS

- Wet process industries
- Docks, piers, boardwalks
- Railroad structures
- Bridges and highway structures
- Mine timbers
- Refrigeration plants
- Commercial buildings
- Sanitary works and water supply
- Stadia

Their reports (available to you) cover over 21,000,000 feet of Wolmanized Lumber, some in service over 15 years. Yet renewals because of decay amounted to less than 0.2%.

This service-proved lumber is easy to handle, clean, odorless and paintable. It is distributed through regular trade channels under the one name—Wolmanized Lumber. For further information about the material, or data on its performance, write to American Lumber & Treating Company, 1649 McCormick Bldg., Chicago, Ill.

*Registered Trade-Mark

WOLMANIZED LUMBER

ON NEW POTOMAC RIVER BRIDGE* . . .

151,500 sq. ft. of I-BEAM-LOK reduces

* Designed for the Maryland State Roads Commission by J. E. Greiner Co., Consulting Engr. Baltimore, Maryland.

I-Beam-Lok is easy to erect. Units made to proper length and width reach the job fabricated to fit the individual project. When desired, openings are cut out for drains, truss members and supports. After being placed and adjusted to final position, simple field welding and pouring of concrete filler completes the roadway. Elimination of many costly and complicated operations necessary in other types of floor construction assures a high-quality, safe and lasting job with a minimum of skilled labor.

In this photograph note the traveler crane on the roadway (at rear) which was used to hoist the I-Beam-Lok units from truck or barge below and set in place on the roadway. This method of hoisting and placing make possible the record set by the Harris Structural Steel Company in placing U·S·S I-Beam-Lok on this important structure.

Ready for the I-Beam-Lok. Note the use of transverse floor joists on deep longitudinal girder stringers. The relatively wide spacing of these joists, in addition to saving weight, eliminates many details and connections between the stringers, joists and I-Beam-Lok. It also allows the most efficient use of I-Beam-Lok by applying it on its maximum permissible spans. The transverse floor joists further provide extremely sturdy and simplified supports for the curb and guard rail.

Here's what speeds up installation. Unfilled units of U·S·S I-Beam-Lok, after being placed in position and tackwelded to the stringers, provide a temporary working deck over which trucks and other equipment may move. Transit mixer trucks can move safely over the unfinished flooring, and material for curbs, sidewalks, handrails, tools and other equipment can be delivered without interruption.

deadload of floor 4,545,000 pounds!

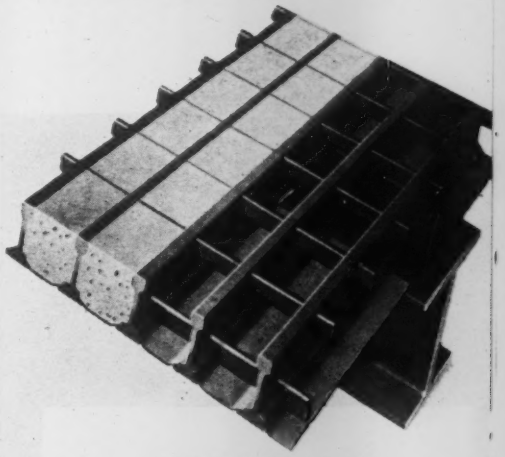
THE 4¼" U·S·S I-Beam-Lok concrete-filled floor used on this important bridge weighs only 55.5 lbs. per sq. ft. Thus in the 24 ft. roadway there is a weight saving of 720 lbs. per lineal foot as compared to the weight of the ordinary reinforced concrete slab of equivalent strength.

In this typical installation the deadload saved by the I-Beam-Lok floor has resulted in appreciable reduction in number of piles, size of piers, and weight of superstructure which was reflected in large savings in the cost of the entire structure.

But U·S·S I-Beam-Lok has other advantages besides its outstanding ability to save weight and money. This bridge floor is strong. It is long-lasting. Costs little for upkeep. It is firesafe. Its smooth, hard, armored surface minimizes wear and has high anti-skid value. Here's a floor safe for high-speed traffic. A floor that goes down fast and easily and stays down in service.

No wonder more than 4,000,000 sq. ft. of U·S·S I-Beam-Lok is being used on bridge floors from one end of the country to the other. No wonder the most prominent authorities in bridge engineering have shown their confidence in this modern flooring by using it on some of the most famous bridges, built or re-floored in the past few years.

Find out about I-Beam-Lok, the modern floor for modern traffic. Our engineers will gladly discuss its possibilities with you.

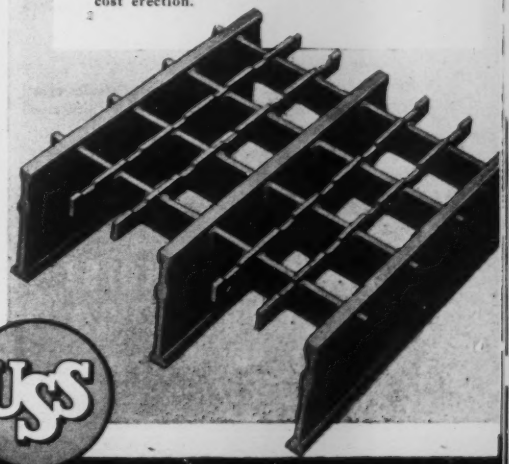


U·S·S I-BEAM-LOK CONCRETE-FILLED FLOORING

consists of a series of alternating steel I-beams and concrete ribs, securely tied and locked together by intersecting steel cross-bars which pass through the beams and ribs at both top and bottom of the slab. Upper edges of the cross-bars, set flush with the tops of the I-beams, provide a steel armoring for the roadway surface. Steel form strips, tack-welded between the lower flanges of the I-beams, provide a supporting form for the concrete. The three smaller sizes, 2½", 3" and 3½" depths, weighing 40.2, 47 and 53.5 lbs. per sq. ft., are available in units up to 4 ft. wide and 49 ft. long; the 4¼" size is available in units up to 6 ft. wide and 49 ft. long.

U·S·S I-BEAM-LOK OPEN FLOORING

This all-steel flooring weighs only 18.6 lbs. per sq. ft., is recommended wherever dead load must be kept to a minimum. It can be applied *directly* to the stringers on spacings up to 4' centers to permit H-20 loadings. The carrying I-beams are a full 5 inches deep. Two supplementary bars running parallel to the tops of the I-beams produce an interlocked unit, with self-cleaning rectangular openings 1⅝" by 2¾" which will not clog up with dirt, debris, snow or ice. Large size of units, 6'2" wide up to 49' in length, makes possible fast handling and low-cost erection.



U·S·S I-BEAM-LOK

"New life for old bridges . . . Longer life for new"

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

USS

UNITED STATES STEEL

Riggers attaching one of the half-mile-long 3-inch main cableways to the head tower. The work is being handled from a scaffold suspended from the hook of the AMERICAN Pillar Crane which is permanently mounted on top of the 460-foot head tower. Notice how many CROSBY CLIPS appear in this striking picture.

"Yep a pretty lofty perch," BUT LOOK AT THE PROTECTION

genuine CROSBY CLIPS"

When you work in a swinging scaffold hung from a "sky hook" 460 feet straight up, that's when you want to KNOW that the cable fastenings are one hundred per cent safe. The one sure way to KNOW is to standardize on Genuine CROSBY CLIPS.

Experienced riggers swear by the Genuine CROSBY CLIP because they know its dependability is proved by a 58-year safety record and that it has everything it takes to hold wire rope safely in any service: correct gripping design; generously proportioned drop forged steel base; over-size U-bolt and nuts; a thick anti-rust armor of zinc applied by the Hot Dip process.

Dealers with stocks of all sizes in all principal cities.

AMERICAN HOIST & DERRICK CO.

CHICAGO ST. PAUL, MINN. NEW YORK

AMERICAN TERRY DERRICK CO., SOUTH KEARNY, N. J.

(*Continued from p. 103*)

resigned recently to accept a position with REA in Washington, D. C., has been succeeded by **Clarence E. Bryant,** of Powers Lake, assistant chief engineer.

E. B. Coolidge, of Great Falls, and **J. E. Harlowtown,** have been named to the Montana highway commission by Governor Sam C. Ford, to represent two newly created districts in the state. Both were named for a four-year term.

George D. McLean, former district director of operations for the El Paso District of WPA in Texas, has been appointed assistant state safety consultant to succeed **Clyde R. McKinney,** who has resigned.

R. P. Jones, district material inspector for the Iowa state highway commission at Council Bluffs, has resigned to become field engineer in the soil-cement bureau of the Portland Cement Association. **Andrew M. Hensing,** inspector in the commission's Ames, Iowa, laboratory, has been promoted to replace him. **A. S. Devries,** another Ames laboratory inspector, has been named district materials inspector to replace R. H. Dinsmore, Cedar Rapids, Iowa, who died recently.

Albert Park, Cheyenne, Wyo., a former WPA area engineer, has accepted a position with the Public Work Reserve as area planning engineer; his territory will take in the entire state.

Kenneth H. Spies, sanitary engineer with the South Dakota State Board of Health, has resigned to accept a position as assistant sanitary engineer with the Oregon State Health Department at Portland, Ore. **Jess Robinson,** sanitary engineer of the State Board of Health at Pierre, S. D., will replace Mr. Spies as secretary and treasurer of the South Dakota Society of Engineers and Architects, a position which Mr. Spies had held during the current year.

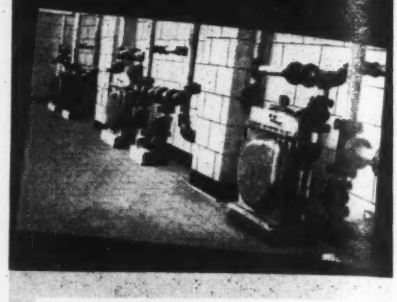
John Sullivan, city engineer at Meade, Kan., has been appointed county engineer for Haskell County with headquarters at Sublette.

William H. Hall, assistant city engineer at Oklahoma City, has resigned to join the teaching staff of the Oklahoma A. & M. College at Stillwater, Okla.

O. J. Eidmann, consulting engineer at Topeka, Kan., has been named as a member of the Kansas Engineering Board, to fill the vacancy made by the death of R. J. Paulette.

(*Continued on p. 116*)

ACCURATE, TROUBLE-FREE EMCO SEWAGE GAS METERS IN THE MOST MODERN PLANTS

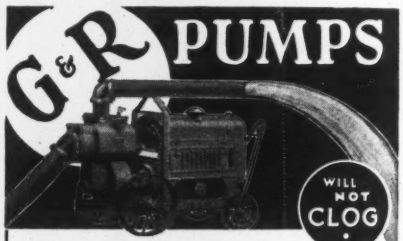


Accurate measurement of all gas generated in sewage plants is assured through the use of EMCO Pressed Steel Meters which operate by the positive diaphragm displacement method. Due to their compact design, they require less floor space than any other meter of the same rated capacity. Their sturdy construction is a safety factor important in a plant of this character.

Nordstrom Lubricated Plug Valves are specified due to their resistance to leakage and the fact that they always open or close easily. Their basic construction makes them inherently resistant to corrosion and erosion. And don't forget, in sewage disposal plants everywhere Nordstrom Valves have proven that they will outlive the average valve several times over.

PITTSBURGH EQUITABLE METER CO.
MERCO NORDSTROM VALVE CO.
410 N. LEXINGTON AVE., PITTSBURGH, PA.

G & R PUMPS



WILL NOT CLOG

The most DEPENDABLE Pump for the Least Money

Claims of fastest priming, highest suction lift, more gallons per minute, etc., do not pump water. On the job, the pump must do its own talking, and with dirty water, many a pump is inclined to stutter—and stop.

Let G & R Pumps tell you their own story on any job. They will deliver as much, and usually more, water under any condition, than any other pump. We will ship you one and let you be the judge.

Remember this about G & R Pumps —THEY WILL NOT CLOG—THEY ASK NO TIME OUT. Play safe! That is why more contractors are standardizing on G & R Pumps than on any other make.

Distributors in 100 principal cities are ready to make prompt delivery of the G & R Pumps you need.

THE GORMAN-RUPP CO. Mansfield, Ohio

READ ALL ABOUT IT!

Read all the up-to-date facts about Toncan* Iron—the pipe made of *open-hearth iron* alloyed with copper and molybdenum for greatest rust and corrosion-resistance among ferrous materials in its price class.

This new Toncan Iron Pipe booklet is the finest and most complete ever published. From cover to cover are 48 pages of interesting reading—telling what Toncan Iron is made of, how it's made, why it resists corrosion, its other features and advantages, results of tests. It gives fabricating data and specifications—tells how it is used and its record of service—suggests ways to increase the life and reduce the cost of piping systems.

There's one of the new Toncan Iron Pipe booklets ready to be put in the mail for you. A request is all it takes to get it on its way. Write for your copy, today.

*Reg.U.S.Pat.Off.

RESEARCH WILL NOT STOP!

One of our most important activities at Republic always has been research. Today's emergency has not retarded this work. On the contrary, it has greatly intensified our efforts.

We are carrying on a relentless and unceasing program directed toward the development of new steels for certain critical defense problems and the improvement of present steels.

Laboratory and plant research, commercial market research, product development research—all are exploring every possible avenue which may lead to *better* Republic steels for you in the future.

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PRESIDENT

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REPUBLIC TONCAN IRON

An alloy of refined open-hearth iron, copper and molybdenum—*that grows old slowly*

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

CEMENT AND LUMBER price changes share the spotlight in the December construction material list. Portland cement in cloth bags is up 15c. per barrel in Detroit, 10c. in Baltimore, and 5c. in Dallas. The San Francisco cloth bag price has been withdrawn, but the price in paper is 25c. per barrel higher than a month ago.

Short leaf Southern pine is $2.00 to $4.00 lower in Atlanta, and off $1.00 on 1-in. sizes in New York, but up $1.00 on 1x8-in. in Chicago. St. Louis prices are mixed. Spruce is $2.00 higher on 1-in. sizes in Boston. Douglas fir is down $2.00 in New York.

Structural steel shapes remain at last month's levels. Reinforcing steel is 9c. per 100 lb. higher in Detroit. Ready-mixed concrete is up 25c. per cu. yd. in Baltimore, Minneapolis and St. Louis. Structural clay tile is up in Baltimore and Detroit, but off $2.00 per M in St. Louis. Brick prices increase in Atlanta, Detroit and Kansas City.

Skilled labor rates are unchanged from a month ago. The common labor rate on heavy construction in Kansas City is now 54c. per hour, an increase of 4c. from November.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT (Per bbl., carload lots, including 40c per bbl. for bags, cash discount not deducted)			SAND AND GRAVEL (Per ton, carload lots)			CRUSHED STONE (Per ton, carload lots)		CRUSHED SLAG (Per ton, carload lots, f.o.b. plant)		CONCRETE Ready Mixed 1:2:4, 50 c.y. or more, delivered
	Cloth Bags *a*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.73	$2.48	$2.43	$1.75	$1.85	$1.95	$1.75	$1.85	$1.55	$1.65	$7.90
Baltimore	2.46	2.21	2.01	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	7.25
Birmingham	2.50	2.25	2.05	1.75	1.75	1.40/1.50	1.00	1.00	.90	1.15	5.80
Boston	2.75*b*	2.50*b*	2.30	1.40‡	1.40‡	1.00‡	1.40‡	1.40‡	....	....	7.25*m*
Chicago	2.60	2.35	2.20	2.00‡*d*	2.00‡*d*	2.00‡*d*	2.00‡*d*	2.00‡*d*	1.50‡	1.50‡	....
Cincinnati	2.31	2.06	1.81	1.20	1.20	1.10	1.80	1.80	....	....	6.60
Cleveland	2.29	2.04	....	1.50*i*	1.50*i*	1.30*i*	1.90*i*	1.90*i*	1.70*i*	1.70*i*	7.30*i*
Dallas	2.52	2.27	2.07	1.75*p*	2.00*p*	1.25*p*	1.69*p*	1.84*p*	....	....	6.20
Denver	3.08	2.83	....	1.20	1.40	.90	....	....	....	....	7.25
Detroit	2.39	2.14	1.94	1.31	1.41	.91	1.50	1.50	1.65‡	1.65‡	6.50
Kansas City	2.56	2.31	2.16	1.85	2.30	1.00	1.91	1.91	....	....	7.25*n*
Los Angeles	2.25*b*	2.05*b*	....	1.20	1.20	1.15	1.20*f*	1.20*f*	....	....	6.35
Minneapolis	2.90	2.65	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	7.60*j*
Montreal	....	1.95*rs*	1.79*rs*	....	....	1.25‡*t*	.85‡*ct*	1.00‡*ct*	....	....	6.45*ls*
New Orleans	2.41	2.16	1.96	1.50	1.50	1.25	....	....	....	....	7.25
New York	2.55‡	2.30‡	....	1.50*de*	1.50*de*	.90*de*	1.65*de*	1.75*de*	....	....	6.75
Philadelphia	2.32	2.07	1.87	1.55‡	1.65‡	1.35‡	....	....	1.10	1.10	8.20*k*
Pittsburgh	2.44	2.19	1.99	1.40‡	1.40‡	1.70‡	2.25‡	2.25‡	1.50	1.50	8.25
St. Louis	2.80	2.52	....	1.50‡	1.50‡	1.25/1.50‡	1.10*h*	1.10*h*	.75*g*	.75*g*	8.00
San Francisco	*u*	2.21	1.76	1.36	1.36	1.36	1.46	1.46	....	....	6.95
Seattle	2.95*o*	2.70*o*	....	1.00*o*	1.00*o*	1.00*o*	2.00*o*	2.00*o*	....	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount 35c. 500 to 2000; 70c. 2000 to 5000; 95c. over 5000. *l* Up to 200cu. yd. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u* Price withdrawn.

CASH DISCOUNTS CEMENT to Contractors: truck delivery. 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind.	$1.70	$1.65	Ironton, Ohio	$1.60	$1.55	Richard City, Tenn.	$1.80	$1.75
Dallas, Tex. (Inc. 10c. tax)	1.85	1.80	Limedale, Ind.	1.70	1.65	Steelton, Minn.	1.80	1.75
Hannibal, Mo.	1.70	1.65	Norfolk, Va.	1.75	1.70	Universal, Pa.	1.65	1.60
Hudson, N. Y.	1.75	1.70	Northampton, Pa.	1.55	1.50	Waco, Tex (Plus 10c. tax in Tex.)	1.75	1.70
Independence, Kans.	1.70	1.65	North Birmingham, Ala.	1.70	1.65	Montreal (8% sales tax incl.)	1.68	1.67

PAVING BRICK, BLOCKS, ASPHALT, ROAD OILS—F.O.B. CITY

	PAVING BRICKS AND BLOCKS			PAVING ASPHALT (Per ton, less than 80 penetration)		ASPHALT BINDERS—FLUXES (Per gal., 80-300 penetration)		CUTBACK ASPHALT (Per ton)		ROAD OILS (Per gal.)	ASPHALT EMULSION (Quick-breaking) (Per gal.)	
	Granite per M. lots of 50,000 4x4x8 in.	Brick per M. 3-4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$17.30*e*	$23.83*e*	$0.0695*e*	$0.1018*e*	$0.0734*he*	$0.1257*h*	$0.0634*e*	$0.0734	$0.1257
Baltimore	165.00‡	45.00‡	2.90	14.00	20.00	.06	.09	.065*h*	.115*h*	.....	.....	.....
Birmingham	.....	24.50*j*‡	....	18.20	23.20	.0747	.1047	.0834*h*	.1484*h*	.....	.....	.....
Boston	90.00	50.00	3.50	14.00	20.00	.06	.09	.065*h*	.115*h*	.065	.09‡	.12‡
Chicago	150.00	47.50	1.85*d*	14.50	18.50	13.00*g*	17.00*g*	.065*h*	.11*h*	.055	.10	.135
Cincinnati	112.00	37.50	....	16.00	20.00	.08	.....	16.80	.....	.07	.....	.085
Cleveland	110.00	39.00	2.25	20.00	25.50	.095	.115	.105*h*	11.00	.0675	.09	.10
Dallas	.....	36.00	....	13.25	20.30	.06	.103	16.00	24.80	.055	.05/.07	.07/.09
Denver	.....	27.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	35.00	.....	14.10*f*	19.00*f*	.061	.1025	14.10	18.60	.0425	.0645	.098
Kansas City	.....	40.00	.....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	....	6.50*b*	15.00	6.50*bg*	15.00*bg*	5.50*b*	.....	.0172	.0525	.1125
Minneapolis	.....	.....	1.90*d*	21.20*m*	27.70	.10*m*	.126	19.00*m*	32.64	.06*m*	.....	.....
Montreal	75.00*k*	.....	3.62*k*	16.60*k*	24.25*k*	.116*k*	.1485*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	....	14.00*a*	19.00*a*	.055	.085	.06*h*	.09*h*	.....	.078	.....
New York	.....	.....	....	15.00	21.00	.06	.09	.065*h*	.115*h*	.....	.0725	.....
Philadelphia	120.00	42.50	....	15.00	22.00	.06	.12	.07*h*	.13*h*	.06	.07	.13
Pittsburgh	135.00	38.75	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis	115.00/125.00	37.00	....	14.00	18.00	12.00*g*	16.00*g*	.055*h*	.095*h*	.04	.09	.125
San Francisco	.....	70.00	....	9.50	18.00	9.50*g*	18.00*g*	10.00	17.50	9.50*g*	.0525	.1125
Seattle	.....	60.00*c*	....	16.70	26.10	.....	26.10*g*	12.50/13.50	26.00/27.00	10.75*g*	.0575*i*	.1308*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 6 to 8-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3½x8½ in. *k* tax included. *m* August prices; tank car price withdrawn in September.

ONE CONTRACT—

ONE RESPONSIBILITY—PLUS THE *KNOW-HOW*

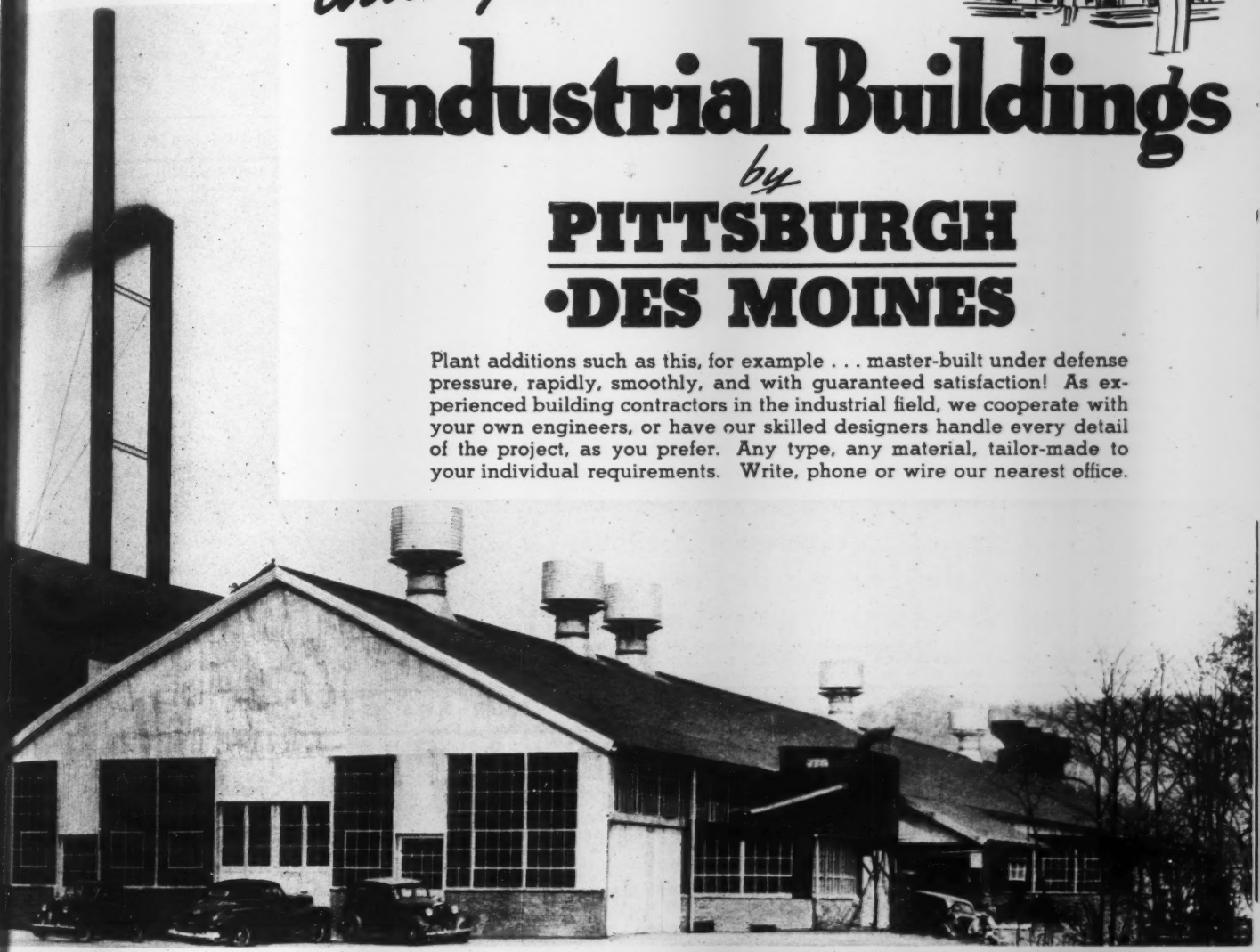
that gets things done!

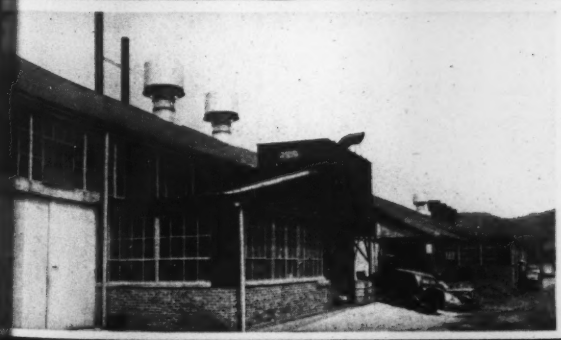
Industrial Buildings

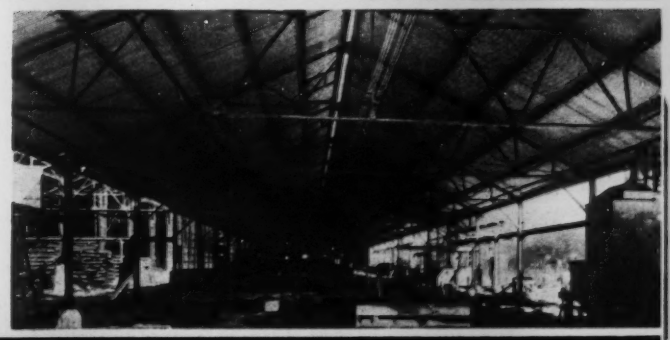
by

PITTSBURGH •DES MOINES

Plant additions such as this, for example . . . master-built under defense pressure, rapidly, smoothly, and with guaranteed satisfaction! As experienced building contractors in the industrial field, we cooperate with your own engineers, or have our skilled designers handle every detail of the project, as you prefer. Any type, any material, tailor-made to your individual requirements. Write, phone or wire our nearest office.







PITTSBURGH • DES MOINES STEEL CO.

PITTSBURGH, PA. 3414 NEVILLE ISLAND—DES MOINES, IOWA, 915 TUTTLE STREET

NEW YORK, ROOM 916, 270 BROADWAY • CHICAGO, 1216 FIRST NATIONAL BANK BUILDING

DALLAS, 1219 PRAETORIAN BUILDING • SAN FRANCISCO, 621 RIALTO BUILDING

SEATTLE, 1122 EIGHTH AVENUE, SOUTH

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton: Standard	Light	Re-rolled	TRACK SUPPLIES: Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	$3.75
Chicago	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	3.75
Pittsburgh	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	3.75
Buffalo	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	.....
Cleveland	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	.....
Detroit	.....	2.25‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gulf ports	2.45*a*	2.50*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	.....
Pacific ports	2.75*a*	2.80*a*	.....	.....	2.95*a*	.....	.....	.....	.....	.....	2.30	.....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates, alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per c.l.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ¾ in., base price: 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq.yd., carload lots: Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 s.f., carload lots: 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per sq. yd.	SHEET PILING Per 100 lb. base price
Atlanta	$2.34	$2.39	$2.39	.02½	.10	$21.06	$23.00	$1.82	$1.35	$0.1719	$3.04
Baltimore	3.70	2.90	2.75	.....	.10	31.00	32.00	1.70	1.27	.1611	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.50	1.80	1.34	.1701	.....
Boston	3.75	3.11	3.01	$20 C.L.	.10	17.00	19.00	1.76	1.31	.1656	2.77
Chicago	2.10*a*	2.15	2.15	.03	.05	21.00	23.00	1.67	1.25	.1575	2.40
Cincinnati	3.68	2.51*cd*	2.51*cd*	.....	.05	19.50	21.50	1.66	1.25	.1566	.....
Cleveland	3.58*g*	2.15	2.15	.02½	.10	19.50	21.50	1.66	1.25	.1566	.....
Dallas	6.00	3.40	3.40	.....	.....	24.50	26.50	1.93	1.42	.1827	.....
Denver	4.35	3.95	3.80	.....	.....	26.50	28.50	1.97	1.45	.1863	.....
Detroit	3.65‡	2.34	2.24	.....	.10	22.00	24.00	1.68	1.26	.1584	2.66
Kansas City	4.17	2.61*cd*	2.61*cd*	.0	.05	19.50	23.50	1.78	1.33	.1683	2.86
Los Angeles	3.65*f*	2.25	2.10	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis	3.80‡	2.48*c*	2.48*c*	.0	.10	25.00	27.00	1.80	1.34	.1701	2.73*d*
Montreal	3.90*i*	2.65*i*	2.55*i*	.....	.....	26.00*hi*	33.00*hi*	2.58*i*	3.22*i*	.264*i*	.....
New Orleans	4.40	2.52	2.52	.05	.10	21.50	23.50	1.82	1.35	.1719	2.875
New York	3.75	2.76*c*	2.76*c*	.....	.15	17.50	19.50	1.76	1.32	.1665	2.74
Philadelphia	3.55	2.47	2.47	.....	.....	.....	.....	1.71	1.28	.1611	2.72
Pittsburgh	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis	3.69	2.39	2.39	.0	.05	28.00	34.00	1.69	1.27	.1602	2.70
San Francisco	4.70	2.65	2.50	.02½	.10	21.00	24.50	1.93	1.42	.1827	3.00
Seattle	2.75*e*	2.50*e*	.....	.....	.....	34.50	38.50	1.93	1.42	.1827	2.95*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE: Per foot, std. 8 in., s.s.	delivered std. 12 in., s.s.	ASTM 24 in.,	C13-35 36 in.,	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14-35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h*: 1 to 3 in., Butt Weld Black %	Galv. %	3½ to 6 in.; Lap Weld Black %	Galv. %
Atlanta	$49 40	$0.26*b*	$0.468*bc*	$1.8525	$1.68*c*	$85.00	$128.00	$0.45	$1.642	48.4	54.2	59.7	51.2
Baltimore	52.80	.45	.70	2.50	6.90	120.00	160.00	.75	2.00	65.5	57.5	63.0	54.5
Birmingham	45.00	.275	.495	1.95	4.66	100.00	220.00	.40	1.60	62.2	54.2	59.7	51.2
Boston	55.00	.40	.75	....	....	210.00‡	325.00‡	.65	2.30	64.1	56.1	61.6	53.1
Chicago	53.80	.28	.54	2.25	6.25	100.00‡	150.00‡	.38	1.48	67.0	59.0	63.5	55.0
Cincinnati	52.70	.231	.4455	1.80	5.125	105.00	170.00	.60	1.70	65.9	57.9	63.4	54.9
Cleveland	54.24	.224	.432	1.80	5.125	81.60	125.00	.35	1.50	67.8	59.8	65.3	56.8
Dallas	58.20	.305	.549	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3
Denver	60.60	.24†	.52†	2.16†	.....	130.00	240.00	....	....	58.4	50.4	55.7	47.2
Detroit	54.24	.245	.4725	1.935	4.60	78.60	125.00	.35	1.50	66.3	58.3	63.8	55.3
Kansas City	55.12	.315	.59	2.20	5.86	140.00	260.00	.45	1.60	62.9	54.9	60.0	51.5
Los Angeles	55.00	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	59.6	51.6	57.0	49.6
Minneapolis	59.00	.275†	.495†	1.98†	5.14†	.....	.....	.70	1.80	64.2	56.2	60.7	52.2
Montreal	60.00	.55	.90	3.68	5.95*e*	135.00‡	260.00‡	.48*l*	1.92*l*	.....	.....	.....	....
New Orleans	51.38	.26	.48	1.69	.....	150.00	220.00	.37	2.10	62.4	54.4	58.8	50.3
New York	52.20	.455	.8775	2.925	7.65	.....	.....	.50	1.20	64.9	56.8	62.4	53.9*i*
Philadelphia	.....	.....	.....	.....	.....	.....	.....	...	....	65.3	57.3	62.8	54.3
Pittsburgh	55.60	.245†	.4725†	1.845†	5.4325	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5
St. Louis	52.48	.28	.504	2.016	4.50	85.00	220.00	.90*j*	1.60*k*	56.4	47.6	52.5	38.1
San Francisco	58.00	.3625*d*	.6525*d*	2.61	6.52	115.50	192.50	.54	2.75	45.0	31.0	47.0	34.5
Seattle	55.35	.375	.675	2.70	6.75	84.00	187.50	.45*f*	1.40*f*	.....	.....	.....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N.J. (base) $49.00. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ½ in., 8½c.; ¾ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½ in.; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76-37. *k* Reinforced; spec. C 75-37. *l* Plus sales tax.

50,000 YDS. A DAY

Shown here: Part of the big fleet of 143 Allis-Chalmers tractors and Allied earth-moving equipment: 73 two-cycle Diesel tractors, 7 A-C gas tractors, two Leaning Frame Graders, 20 Model A-D Motor Graders, 21 Baker bulldozers, 20 Gar Wood scrapers!

21 of these 2-cycle Diesels are equipped with Baker bulldozers. Operators throttle through bulldozing, smoothly, quickly. Hanging-on ability of 2-cycle engine means less gear shifting . . . more work done.

Valuable seconds are saved . . . more and bigger loads are hauled every hour with 2-cycle Diesel power pushing and pulling. You "gun" it and go . . . like "steam power"!

The 15-yd. Gar Wood scrapers are quickly loaded. You work in higher gear . . . at faster speed . . . you pull away with heaped loads and go into high speed in less time . . . shorten round trip time.

W. E. Callahan Co., assembles huge array of tractors, shovels, trucks, graders and other earth-moving equipment to rush huge defense project.

BIG is a one-word description of what's taking place on the Southwestern Proving Ground, ordnance project, Hope, Arkansas. BIG the way Uncle Sam does it . . . and BIG the way W. E. Callahan Construction Company is doing it. Over 4,000,000 cubic yards are being moved . . . at the astounding daily average of 50,000 yards. 70,000 yards scored one day! The huge undertaking is being rushed through by "an array of equipment that rivals the claims of some highly touted mechanized armies".* A major part of the big mechanized force are Allis-Chalmers and Allied manufacturers' equipment. 143 UNITS! 73 TWO-CYCLE DIESEL TRACTORS, 7 A-C GAS TRACTORS, TWO LEANING FRAME GRADERS, 20 MODEL A-D MOTOR GRADERS, 21 BAKER BULLDOZERS, 20 GAR WOOD SCRAPERS! On 24-hour duty . . . hitting a fast, steady pace . . . they're out for a record in time and cost . . . and are setting it!

*** According to the Public Relations Director of the Hope Project.**

ALLIS-CHALMERS

TRACTOR DIVISION · MILWAUKEE · U. S. A.

2-CYCLE DIESEL POWER

3 Sizes—HD-7, HD-10, HD-14 60 to 132 Drawbar H. P.

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) — All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)									LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD* Rail freight increment (See note for base price)
	1x6 S&B	1x8 S&B	2x4 S&B	2x6 S&B	2x8 S&B	2x10 S&B	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	⅜"
Atlanta	$25.00	$25.00	$24.00	$24.00	$26.00	$27.00	$43.00	.....	.....	$60.00	$65.00	$17.75
Baltimore	39.00	40.00	40.00	38.00	38.00	40.00	56.00	.....	.....	89.00	94.00	17.35*g*
	44.00	*44.50*	*45.00*	*45.00*	*45.00*	*47.00*	*66.00*	*$59.00*	*$59.00*	.....	.....	.....
Birmingham	34.50	34.50	32.00	32.00	32.00	34.00	53.00	51.00	53.00	.....	.....	16.25
[1]	37.50	37.50	37.00	37.00	37.00	43.00	65.00	.....	.....	67.50	70.00	.....
Boston	40.00[2]	40.00[2]	45.00[2]	45.00	70.00[1]	75.00[1]	85.00[1]	.....	.....	85.00	90.00	17.35*g*
	40.00	*40.00*	*60.00*	*60.00*	*60.00*	*60.00*	*70.00*	*75.00*	*75.00*	.....	.....	.....
Chicago	43.00	43.00	42.00	42.00	44.00	45.00	53.00	.....	.....	90.00	100.00	13.80
	45.00	*44.00*	*44.00*	*44.00*	*46.00*	*47.00*	*60.00*	*60.00*	*60.00*	.....	.....	.....
Cincinnati	40.00	41.50	38.00	39.50	40.00	41.00	52.50	.....	.....	60.00	63.00	16.25
	.....	.....	.....	.....	.....	.....	*54.50*	*54.50*	*54.50*	.....	.....	.....
Cleveland	42.00	42.00	42.00	42.00	44.00	47.00	55.00	55.00	55.00	90.00	90.00	16.70
Dallas *e*	39.00	40.00	39.00	37.50	38.00	39.50	53.00	53.00	53.00	78.00	83.00	13.90
Denver ‡	54.00[4]	52.00[4]	55.00[4]	54.00[4]	54.00[4]	56.00[4]	59.00[4]	69.00[4]	75.00[4]	.....	.....	9.90
Detroit	46.00	46.00	46.00	46.00	46.00	48.00	53.00	.....	.....	53.00	61.50	16.25
	.....	.....	.....	.....	.....	*51.50*	*64.00*	*60.00*	*60.00*	.....	.....	.....
Kansas City	42.50	45.00	42.50	42.50	45.00	47.50	55.00	.....	.....	70.00	75.00	12.25
	50.00	*50.00*	*50.00*	*50.00*	*50.00*	*50.00*	*60.00*	*70.00*	*70.00*	.....	.....	.....
Los Angeles *a*	*52.00*	*52.00*	*50.00*	*50.00*	*52.00*	*52.00*	*56.00*	*65.00*	*56.00*	.....	.....	9.35*gh*
Minneapolis ‡*b*	48.00[4]	48.00[4]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.05
‡	*50.00*	*50.00*	*52.00*	*51.00*	*51.00*	*52.00*	*58.00*	*60.00*	*60.00*	.....	.....	.....
Montreal †[7]	*36.00*	*38.00*	*36.00*	*38.00*	*40.00*	*46.00*	.....	.....	.....	155.00	165.00	.....
	42.25	*42.25*	*42.00*	*44.00*	*44.00*	*45.75*	*50.25*	*50.25*	*50.25*	.....	.....	.....
New Orleans	31.50	31.50	33.75	31.75	32.00	34.25	48.00	.....	.....	58.50	69.00	13.90
	31.00	*31.00*	*33.00*	*31.00*	*31.00*	*32.00*	*33.00*	.....	.....	.....	.....	.....
New York ‡	45.00	46.00	45.00	46.00	47.00	49.00	57.00	.....	.....	100.00*f*	110.00*f*	17.35*g*
‡	.....	.....	*60.00*	*60.00*	*60.00*	*60.00*	*65.00*	*65.00*	*65.00*	.....	.....	.....
Philadelphia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17.35*g*
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh	50.80	53.20	62.75	55.00	60.85	62.50	76.25	.....	.....	.....	.....	17.00
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*88.75*	*88.75*	*88.75*	.....	.....	.....
St. Louis ‡*c*	42.00	42.50	42.00	40.00	41.00	43.00	56.00	*66.00*	*66.00*	78.00	65.00	13.90
San Francisco *d*	*33.50*	*33.50*	*36.25*	*34.50*	*34.50*	*34.50*	*40.00*	*39.50*	*39.50*	.....	.....	7.30*g*
Seattle	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*40.00*	*40.00*	*40.00*	.....	.....	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [5] Western Pine, No. 3 Common. [7] Spruce. [6] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* F.o.b. cars San Francisco freight rate. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax.

NOTE: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on ⅜", $86.50; on ¾", $95.30; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. *Many mills out of market due to rush of defense orders. *g* Lower rate by water shipment. *h* 50,000 lb. minimum

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 — Single or Double Thickness		EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*
	A quality	B quality	
Atlanta	75%	75%	$0.15
Baltimore	79%	80%	.15
Birmingham	75%	75%	.105
Boston	78%	79%	.15
Chicago	79%	79%	.15
Cincinnati	77%	77%	.15
Cleveland	77.2%	77.2%	.19
Dallas	78%	78%	.1625
Denver	77%	77%	.155*e*
Detroit	79–10%	79–10%	.15
Kansas City	76–10%	76–10%	.155
Los Angeles	86%*d*	88%*d*	.1575
Minneapolis	76%	76%	.155
Montreal	40–10%‡	50–5%‡	.155†
New Orleans	70%	75%	.16
New York	81%	82%	.22*f*
Philadelphia	.....	.....	.15
Pittsburgh	79%	79%	.1225
St. Louis	77–10%	77–10%	.155
San Francisco	78%	80%	.155
Seattle	75%	76%	.1575†

Price of 60% Ammonia Gelatin is $0.01 per lb. higher than 40%

a Disc. from list Sept. 1939. *b* Also less 6% tax exemption. *d* Discount from jobbers' list Sept. 15, 1928. ‡ Plus sales tax.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip. † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.11 –.1175	.135 –.1475	.155 –.1675
Rocky Mtn. States	.11 –.1225	.135 –.1525‡	.155 –.1725‡
Pacific N. W. States	.1075–.12	.1375–.15	.1575–.17
Pacific S. W. States	.1050–.1150	.135 –.145	.155 –.165

‡F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES—F.O.B.

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Leaf — Barge	Short Leaf — Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.22	$0.195
12 in.— 2 ft. from butt	6 in.	50 to 59 ft.	.26	.24
12 in.— 2 ft. from butt	6 in.	60 to 69 ft.	.28	.255
14 in.— 2 ft. from butt	6 in.	50 to 69 ft.	.30	.265
14 in.— 2 ft. from butt	6 in.	70 to 79 ft.	.36	.275
14 in.— 2 ft. from butt	5 in.	80 to 85 ft.	.42	.415
14 in.— 2 ft. from butt	5 in.	85 to 89 ft.	.45	.482

RAILWAY TIES

Prices f.o.b., per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr.
Boston	Oak	$1.30	....	$1.80	....
	Pine	1.60	$2.40*a*	2.40	$3.40*a*
New York	S. L. Sap Pine	1.30/1.40	2.35	1.60	2.60
	Mixed Oak	1.55	2.35	2.00	2.95
Birmingham	White Oak	.85	1.50*a*	1.35	1.70*a*
	Southern Pine	.55*b*	1.10*ab*	.70	1.30*a*
Chicago	Oak	....	1.65*a*	....	2.25*a*
	Southern Pine	....	1.53*a*	....	2.13*a*
Los Angeles	Douglas Fir	1.10	1.75*a*	1.60	2.50*a*
Philadelphia	Red Oak	....	....	....	....
St. Louis*	White Oak	1.40	....	1.75	....
	Red Oak	1.40	1.85*a*	1.75	2.35*a*
	Sap Pine or Cypress	1.30	....	1.65	....
San Francisco	Douglas Fir	1.00*bef*	....	....	2.45*caf*
Montreal	Birch or Maple	.65	1.05*a*	.75	1.35*a*

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6" x 8" x 8'6". *c* Empty cell. *d* Zinc. *e* Green. *f* At ships tackle. *August prices; none later quoted.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.00–2.85
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77-80%, flaked, in 400-lb. drums or 100-lb. moisture proof bags, delivered, per ton	20.50–39.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-25.00
Sulphate of copper, in bbl., per 100-lb	5.15-5.50

ROCK is no TOUGHER today than in 1895

• You can't do the same thing for 46 years and not learn a lot about it—and Thew started to learn about rock shovels in 1895, when the first Thew was produced.

Though rock is no tougher today than in 1895, Thew-Lorain rock shovels are! The new, modern 2-yd. Lorain-82 pictured below typifies the latest in Thew's long line of rock shovels. It's a vast improvement over the "old timers," shown above, in power, strength, speed and output. It's but one of the many current Lorains that reflect the value of this 46 years' experience . . . a value which they demonstrate in today's terms by digging more rock, faster, at lower cost.

THE THEW SHOVEL COMPANY, LORAIN, OHIO

LORAIN Rock Shovels 1895-1941

THEW CENTER DRIVE

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE — PARTITION — SCORED Per M. lots of 2,000 pieces or over, 3x12x12 in.	4x12x12 in.	8x12x12 in.	STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over, 8x12x12 in.	10x12x12 in.	12x12x12 in.	BRICK Per M. in quantity, Common backing	Straight hard	LIME Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized or lump
Atlanta	$100.00	$110.00	$195.00	$230.00	$240.00	$240.00	$13.50	$18.00	$26.50	$17.00	$17.00
Baltimore	87.50	95.00	170.00	200.00	250.00	300.00	14.00*k*	17.00*k*	19.50	17.50	*e* 75*m*
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.64	*e* 25*o*
Boston	118.25*t*	126.40*a*	235.50*a*	.....	.....	.....	18.00*i*	21.00*i*	20.00	15.00	*e* 80*p*
Chicago	68.10	72.60	135.90	185.70	234.90	268.10	11.50	12.50	16.40	14.40	12.20
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	17.50	17.50	15.40	12.90	.....
Cleveland	56.50	60.00	112.50	135.00	182.00	209.00	16.00	16.00	15.75*j*	14.50*j*	8.00*m*
Dallas	52.00	54.00	100.00	135.00	200.00	263.00	11.50*i*	13.50*i*	19.00	15.00	7.95*n*
Denver	84.80	94.40	152.70	178.20	212.00	227.90	13.50	17.00	30.00*j*	19.00*j*	30.00*p*
Detroit	74.50	81.60	153.00	194.00	253.00	289.00*e*	17.50	18.00	16.50	13.90	14.90
Kansas City	64.50	66.50	86.00*c*	125.50	159.75	186.25	16.00	24.00	19.10	12.80	10.70
Los Angeles	73.50†*r*	89.50†*r*	128.00†*r*	210.00†*r*	368.00†*r*	460.00†*r*	13.50	15.00	16.50	17.50	17.50
Minneapolis	80.35	85.70	168.45	192.85	176.20	245.20	13.10	15.10*g*	21.00	16.00	19.00
Montreal	72.20*au*	77.50*au*	142.50*au*	76.00*au*	165.80*au*	248.70*u*	17.50†*u*	24.25†*u*	23.20*u*	17.00*u*	12.00*u*
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	78.40	83.60	115.00*c*	193.30*h*	238.80*h*	295.60*h*	13.00	.....	19.00	14.00	17.00
Philadelphia	80.50	85.90	161.10	193.30	238.80	295.60	17.00*s*	19.00*s*	15.70*q*	10.55*q*	13.05*q*
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40	2.55*m*
St. Louis	62.00	88.00	120.00	170.00	187.00	220.00	17.00	18.00	22.00	18.00	2.50*m*
San Francisco	84.00	94.50	225.00	.....	.....	.....	19.00	17.00	.75*o*	2.05*o*	16.40
Seattle	100.00	110.00	220.00	.....	.....	.....	17.50*f*	22.00*f*	20.00*s*	20.00*s*	20.00*s*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00, ½ cash 15 days, balance 30 days. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* 50c. per M. off for cash. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., 180 lb net. *n* Per sack 100 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *q* 25-ton cars. *r* 5% discount 10 days. *s* 2% off cash. *t* 5½ x 8 x 12. *u* Plus 8% sales tax.

PAINT, ROOFING—F.O.B. CARLOAD LOTS

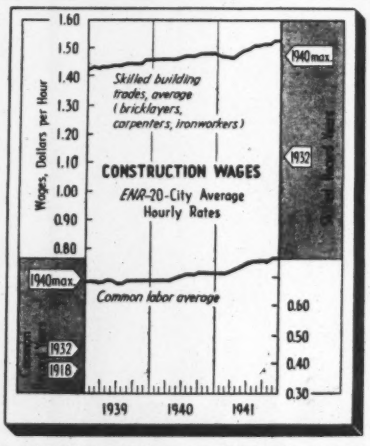
	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *c*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85-90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$9.50	$13.625	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27	$29.00
Baltimore	9.25	13.25	1.95	2.90	2.50	2.80	3.50	3.50	.80	2.75*m*
Birmingham	9.50	13.625	2.35	3.50	1.85	2.15	1.58	1.58	.32	27.00
Boston	9.25	13.25	2.30‡	2.75‡	2.00‡	2.02‡	1.85*h*‡	1.85*h*‡	.50‡	20.00‡
Chicago	9.25	13.25	2.11	2.63	1.72	1.48*h*/*f*	1.50*h*/*f*	1.50*h*/*f*	.26*f*	22.00/*f*
Cincinnati	9.25	13.25	1.70	2.90	1.60	2.40	2.39*h*	2.39*h*	.36	21.00
Cleveland	9.25	13.25	2.70	3.50	2.25	1.93	1.83*h*	1.83*h*	.40	25.00
Dallas	9.25	14.00	1.88	2.11*n*	....	2.30*h*	2.25*h*	2.45*h*	.35	39.00
Denver	9.75	13.75	1.65	2.60	.27*l*	2.45	3.15	3.15	.35	28.00
Detroit	9.25	13.25	1.75	3.00	1.45	2.40	2.50	2.50	.35	26.00
Kansas City	9.25	13.375	2.39*g*	2.55*gr*	2.16*gn*	2.10	2.30	2.30	.28	27.50
Los Angeles	9.50	13.75	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	9.25	13.375	....	....	....	1.93*i*	1.75*hi*	1.75*hi*	.29	22.00
Montreal *p*	9.25	9.00	2.40	2.97	2.51	2.64	1.85	1.86	.63	1.85*k*
New York	9.25	13.25	2.03	2.55	1.64	2.01	1.83*h*	1.83*h*	.23	25.00
Philadelphia	9.25	13.25	....	....	....	....	....	....	...	.....
Pittsburgh	9.25	13.25	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34	26.00
St. Louis	9.25	13.25	1.90/2.00	2.60/2.80	1.60/2.00	1.92	1.91	1.91	.32	23.00
San Francisco	9.50	13.50	1.80	2.75*n*	1.10/2.00	1.89	2.66	2.66	.33	19.50
Seattle	9.50	13.75	1.80	2.60	....	2.12	1.45*h*	1.75	.35	24.15*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266-31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per 100 lb *l* Per lb. *m* Per bbl. *n* May price, no later quotation available. *p* Plus 8% sales tax. *r* Not available.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.375	$1.00	$1.375	$1.00/1.25	$1.25	$0.40	$0.50
Baltimore	1.625	1.375	1.65	1.65	1.50	.70	.70
Birmingham	1.50	1.125	1.50	1.50	1.50	.60	.45
Boston	1.50	1.25	1.50	1.625	1.625	.85	.85
Chicago	1.70	1.625	1.70	1.70	1.70	1.025	1.025
Cincinnati	1.625	1.50	1.55	1.325/1.525	1.625	.75	.75
Cleveland	1.75	1.50	1.75	1.75	1.75	1.00	1.00
Dallas	1.50	1.00	1.25	1.00	1.50	.50/.625	.50/.625
Denver	1.65*b*	1.43*b*	1.43*b*	1.43*b*	1.50*b*	.718*b*	.718*b*
Detroit	1.60	1.40	1.75	1.625	1.675	.80	.80
Kansas City	1.625	1.375	1.50	1.50	1.575	.85	.54
Los Angeles	1.50	1.175	1.50	1.50	1.667	.75	.75
Minneapolis	1.50	1.25	1.50	1.40	1.50*e*	.90	.90
New Orleans	1.50	1.25	1.50	1.375	1.375	.55	.55
New York	2.00*b*	1.85*b*	2.00	2.00*b*	2.00*c*	1.031	.95
Philadelphia	1.65*b*	1.40	1.65	1.50	1.75	.70	.70
Pittsburgh	1.90	1.50	1.75	1.25	1.75	.80	.70
St. Louis	1.25/1.50	1.50	1.75	1.50/2.00	1.25/1.75	.675/.875	.875
San Francisco	1.75*c*	1.375	1.60	1.50	1.667*e*	.85/.875	.85/.875
Seattle	1.65	1.35	1.55	1.50	1.65	.95	1.00
Montreal	.92	.81	.87	.76	.90	.53	.46

b 7 hr. day. *c* 6 hr. day. *d* 35 hr. wk. *e* 30 hr. wk.



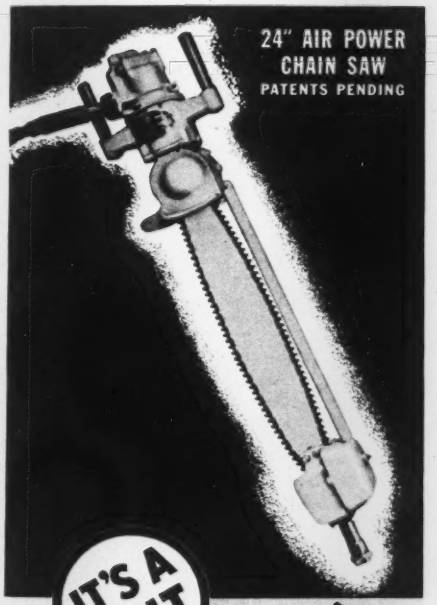
ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) **$1.521**
ENR Common Average: $0.769

Z-I-I-I-I-I-ING 15 SECONDS!

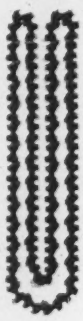
16" One-Man Electric
Chain Saw . . . Pats. Pending

AIR OR ELECTRIC

—because THIS Chain Saw is ALWAYS SHARP

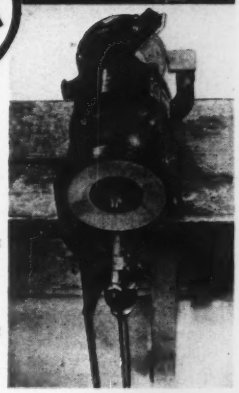


IT'S A UNIT



DISSTON PRECISION CHAIN GRINDER
Pats. Pending

CUTTING CHAIN
Pats. Pending



A narrow, straight cut through an 8" x 12" pine beam in 15 seconds or less. Not just once but every time, because the two drawbacks to chain saws—dull cutting chains and faulty tension—have been completely eliminated in the new

DISSTON
POWER CHAIN SAWS

(Patents Pending)

A foolproof automatic tensioning device adjusts the chain to correct elastic tension for cutting hard and soft woods, knots, fibres, etc., assuring faster straighter cuts. . . . To provide the utmost in performance from this rugged yet light-weight, precision-built saw it is sold as a unit with the DISSTON PRECISION CHAIN GRINDER (Patents Pending) and a reserve cutting chain. With this tool (which is combined with a general utility bench grinder) a semi-skilled workman can sharpen a chain correctly in 15 minutes, thus maintaining top sawing efficiency at all times.

WRITE US TODAY for complete data on Disston Electric and Air Powered Chain Saws. There are sizes and types which will exactly meet the needs of Railroads . . . Pulp and Paper Mills . . . Mines . . . Utilities . . . Lumber Yards . . . Ship Yards . . . General Contractors . . . Government Departments, etc.

HENRY DISSTON & SONS, INC.
POWER CHAIN SAW DIVISION
PHILADELPHIA, PENNA., U.S.A.

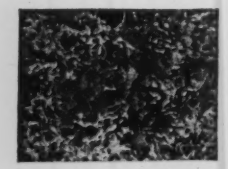
Darling's long list of satisfied users is the result of really outstanding performance. Every step in Darling manufacture — from foundry to finish—is directed toward the smooth, close structure called "dense metal." With it you get more accurate threading — freedom from flaws and shrink— a long life of easy, dependable operation. Next time, specify Darlings!

"We prefer Darling Hydrants and Valves because we don't worry about them after they're in the ground . . . Once installed, they're always ready for use in the years to come."

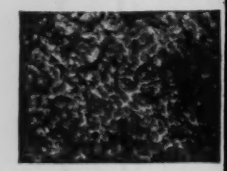
E. J. ROWE, *Sup't. Water and Light Dep't.*

DARLING VALVE & MANUFACTURING CO.
Williamsport, Pa.

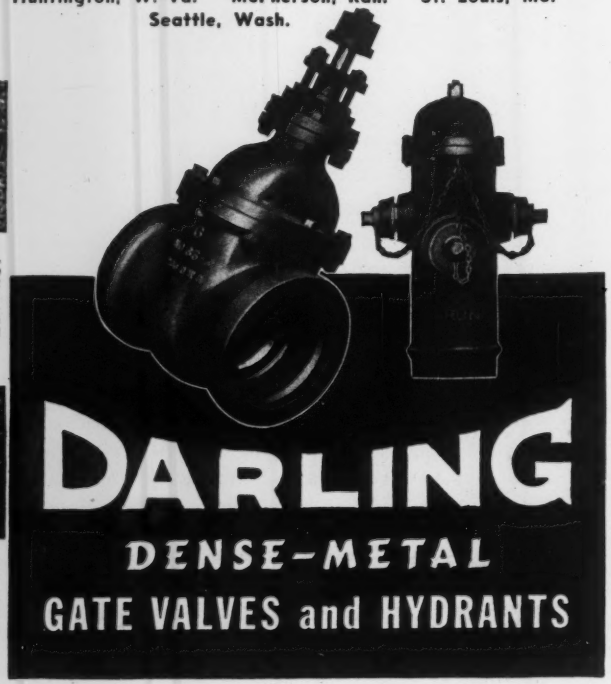
Representatives in:
New York Philadelphia Houston Toledo Pittsburgh
Chicago, Ill. Huntington, W. Va. McPherson, Kan. St. Louis, Mo.
Seattle, Wash.



Photomicrograph (mag. 100x) showing the structure of a typical sample of cast iron as ordinarily produced. Note the entrained inclusions tending to break down the strength of the metal and produce leaks.



Showing the structure of Darling Dense Metal gray iron. In this dense, fine, homogeneous grain structure the shrinkage porosity has been minimized, with resultant pressure tightness, strength and better resistance to abrasion and corrosion.



DARLING
DENSE-METAL
GATE VALVES and HYDRANTS

(*Continued from p.* 106)

Capt. Albert R. Davis, who has been on active duty with the 111th Quartermaster regiment of the Texas National Guard for the past year, has returned to his position as superintendent of the water division for Austin, Tex. While he was in service, his post was handled by **Marvin Turner,** assistant superintendent.

E. W. Dunn, district engineer for the state highway commission at Sioux City, Iowa, has returned to this position after a year's leave of absence as project engineer during construction of the cantonment at Fort Leonard Wood, near Rolla, Mo.

W. C. Ohlsen, bridge designer of the Iowa state highway commission, has taken a leave for active duty as a reserve officer in the army.

W. H. Poston, who has been connected with the Iowa state department of public health, resigned to become assistant superintendent of the water works at Ottumwa, Iowa, on Dec. 1.

George Breck, engineer for the National Youth Administration in Montana, has been named planning engineer for the Public Work Reserve, at Helena.

Robert Kellum, Redwood Falls, Minn., has resigned as Redwood County engineer to accept a civilian appointment in the office of the constructing quartermaster at Fort Smith, Ark.

Ernest Dubuque, former WPA supervisor in Walsh County, N. D., has been named assistant area planning engineer of the Public Work Reserve for that state.

S. W. Gentle, civil engineer, has resigned his position as resident engineer with the South Dakota state highway commission and has accepted a position with the Public Work Reserve, Pierre, S. D. Mr. Gentle has been with the state highway commission since 1922 and has been a resident engineer since 1931.

Paul B. Jenkinson of Greenville, Ohio, graduate of Wayne Technical College there in 1924, who has been a staff member of the Huntington, W. Va., district of the U. S. Engineers since 1931, will be resident engineer on the construction of the $13,000,000 Bluestone Dam on the New River near Hinton, W. Va. Announcement of his appointment was made by **Capt. P. V. Kieffer,** district executive officer.

DUTCHER makes the dirt FLY!

HERE ARE just a few of the many other contractors using Euclids for airport grading: Frank Mashuda and Laub & Collins — Johnstown Airport, Pa. . . . C-G Construction Co. — Wright Field, Dayton, Ohio . . . R. W. Briggs & Co. — Mission Airport, Texas . . . Hardaway Contracting Co. — Moultrie Flying School, Georgia . . . J. L. Sigretto & Sons, Inc. — Morristown Airport, New Jersey . . . Merveldt & Lawson — Bethany Airport, Oklahoma.

18,000 Cu. Yds. PER DAY

Yes, sir! Bottom-Dump EUCLIDS are making the dirt fly for Dutcher Construction Corp. at the New Castle County Airport near Wilmington, Delaware — 18,000 cu. yds. every 20-hour working day.

The entire 2,500,000 cu. yds. on this job is being moved with eight 13-yard and six 10-yard Bottom-Dump EUCLIDS and three 48" elevating graders. These fourteen Euclids are hauling approximately 1500 loads a day, 1800 feet each way.

There are good reasons why Euclids are at work on most defense projects. Be sure to check Euclid dependability and low hauling costs for your next job. We'll be glad to supply the facts and figures.

The EUCLID ROAD MACHINERY Co.
CLEVELAND, OHIO

EUCLID

SELF-POWERED
EARTH • ROCK • COAL • ORE
HAULING EQUIPMENT
And — CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS

EUCLID — THE PIONEER

PROTECT YOUR PLANS . . .

FROM PRYING EYES AND OTHER HAZARDS

with ART METAL PLANFILES

"Keeping an eye" *off* your plans, blueprints, etc. is mighty important these days—with so much vital information trusted to files. Right there is where *Art Metal Planfiles* can do guard duty for you—protecting your valuable records under lock and key from prying eyes, fire and other hazards.

And *Art Metal Planfiles* keep your plans and records shipshape . . . speed work . . . save time. You get true vertical filing of large sheets—constant compression to keep drawings and prints in top-notch condition—easy insertion and withdrawal of a single sheet without disturbing others. No stooping—no climbing—no reaching! The *Planfile* saves valuable space, too—holds 3,000 to 5,000 sheets—replaces 30 old-type, flat filing drawers. Find out how *Planfiles* can be a big help to you. Write today for Catalog ENR. **ART METAL CONSTRUCTION COMPANY, Jamestown, N. Y.**

1888 **Art Metal** 1941

STEEL OFFICE EQUIPMENT

MEETINGS

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual meeting, New York, N. Y., Jan. 21–23, 1942.

NATIONAL SAND & GRAVEL ASSN., 26th annual convention, Netherland Plaza Hotel, Cincinnati, Ohio, Jan. 28–30, 1942.

NATIONAL CRUSHED STONE ASSOCIATION, 25th annual convention, Netherland Plaza Hotel, Cincinnati, Ohio, Feb. 2–4.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, 23rd annual convention, Olympic Hotel, Seattle, Wash., Feb. 16–19.

AMERICAN CONCRETE INSTITUTE, 38th annual convention, Palmer House, Chicago, Ill., Feb. 17–19.

REGIONAL AND LOCAL MEETINGS

GENERAL CONTRACTORS ASSOCIATION, annual dinner meeting, Hotel Commodore, New York City, Dec. 6.

NEBRASKA IRRIGATION ASSOCIATION, annual convention, Kearney, Neb., Dec. 8–9.

CAROLINAS BRANCH, AMERICAN GENERAL CONTRACTORS, 21st annual convention, Sir Walter Hotel, Raleigh, N. C., Dec. 11–12.

NORTH CENTRAL STATES SNOW CONFERENCE, first annual meeting, Michigan State College, East Lansing, Mich., Dec. 11–12.

SOUTH DAKOTA SOCIETY OF ARCHITECTS AND ENGINEERS, annual meeting, Rapid City, S. Dak., Dec. 16–17.

ASSOCIATED CONTRACTORS OF SOUTH DAKOTA, annual meeting, Rapid City, S. Dak., on Dec. 16–17.

ILLINOIS CONTRACTORS ASSOCIATION, annual meeting, Hotel Abraham Lincoln, Springfield, Ill., Jan. 7–8, 1942.

WISCONSIN ROAD SCHOOL, sponsored by Wisconsin Highway Commissioners Association and Wisconsin County Highway Committee Members Association, Milwaukee, Wis., Jan. 7–9, 1942.

KANSAS CONTRACTORS ASSOCIATION, 1942 convention, Kansas City, Mo., Jan. 8–9.

KENTUCKY SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, Lafayette Hotel, Lexington, Ky., Jan. 23–24.

TEXAS SOCIETY OF PROFESSIONAL ENGI-

"Tough and Stable GULF LUBRICANTS are a big help on a tough job like this"

. . . says Contractor on Mountain Highway Project

"Thanks to Gulf Quality Oils and Greases, we're getting efficient, low-cost performance from our equipment."

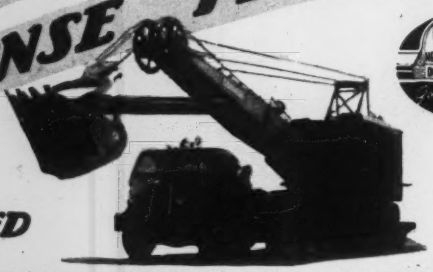
"WE'VE learned from experience that proper lubrication with tough-filmed Gulf lubricants plays an important part in the rapid completion of a contract," says contractor on mountain road project. "On a job like this, for example, our equipment gets full protection under the most punishing conditions. Result: We avoid costly delays from mechanical failures, and secure efficient, low-cost performance."

If you want the same efficient operating record this contractor enjoys, here's the way to get it: Ask a Gulf engineer to recommend the right lubricant for each piece of equipment your are using. His recommendations are based on thorough training and practical experience in the field.

Gulf quality lubricants are quickly available to you through more than 1200 warehouses in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

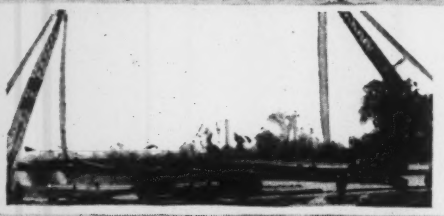
GULF OIL CORPORATION · GULF REFINING COMPANY · PITTSBURGH, PA.

ADDITIONAL DEFENSE PRODUCTION

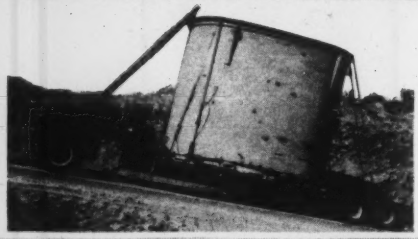


REQUIRED

1• FAST, DEEP, EXCAVATIONS,



2• THOUSANDS OF NEW FACTORIES,



3• MILLIONS OF ADDITIONAL KILOWATTS,

and ROGERS HEAVY DUTY TRAILERS

EXPERIENCE builds 'em

PERFORMANCE sells 'em

PLAYED IMPORTANT PARTS IN THESE PREPARATIONS

ROGERS BROTHERS CORPORATION

135 ORCHARD ST., ALBION, PENNA.

We can help solve your problems on

SLUDGE • GUM
VARNISH • RUST
and CORROSION

in all types of engines and fuel tanks

SEND FOR ENGINEERING AND SERVICE DATA

PETROLEUM SOLVENTS CORPORATION

331 MADISON AVENUE, NEW YORK, N. Y.

Manufacturers of additives for motor oils and solvents for all types of petroleum residues

NEERS, annual meeting, Beaumont, Tex., Jan. 24.

ILLINOIS SOCIETY OF ENGINEERS, annual meeting, East St. Louis, Ill., Jan. 29–31.

CONSTRUCTORS ASSOCIATION OF WESTERN PENNSYLVANIA, annual meeting and dinner, William Penn Hotel, Pittsburgh, Pa., Feb. 4.

MINNESOTA FEDERATION OF ARCHITECTURAL AND ENGINEERING SOCIETIES, annual meeting, Nicollet Hotel, Minneapolis, Minn., Feb. 11–14.

OHIO SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, Deshler-Wallick Hotel, Columbus, Ohio, Feb. 12–13.

SOUTHEASTERN STATE HIGHWAY OFFICIALS, first annual meeting, Grove Park Inn Hotel, Asheville, N. C., Feb. 12–13.

SOUTHWEST ROAD SHOW AND SCHOOL, The Coliseum, Wichita, Kansas, Feb. 24–27.

ELECTIONS AND ACTIVITIES

THE ARKANSAS SOCIETY of Professional Engineers, meeting in Little Rock recently, approved an amendment to its constitution allowing junior engineers to become associate members. The object of the amendment it was stated is to assist in stopping movement of young engineers into labor organizations and to keep engineering on a professional level.

DISCUSSION of the effect of the national defense program on water supply keynoted the annual convention of the Florida section, American Water Works Association, held at Daytona Beach last month. Harry E. Jordan of New York City, secretary of the A.W.W.A., attended the meeting, and presented a paper on "Waterworks Operations under Emergency Conditions." "Problems of Army Water Supply" was presented by A. S. Behrman, of Chicago. Among other speakers were: Louis R. Howson, Chicago, president of the A.W.W.A.; William W. Brush of New York, A.W.W.A. treasurer, and Ralph W. Reynolds, national director of the organization. The meeting was well attended by waterworks engineers and municipal officials from all parts of the state.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA announce that a charter for a chapter has been granted to the Colorado Association of Highway Contractors, Inc., Denver, Colo. Charles B. Berry is president of the new chapter, and James B. Kenney is managing director. The membership includes about 50 of the leading contractors doing highway and heavy construction work in Colorado.

Pencils are projectiles, too!

Never before has the drafting board played such a part in the struggle for...Victory! And as surely as it takes a superior brain to create an advanced design—so it requires a superior pencil to execute it.

Not only does a Dixon *Typhonite* Eldorado pencil facilitate the work of the man at the board, but its smoother, clearer line speeds up the work of the man at the bench. A sharp blueprint can be made only from a sharp, clean drawing! And there is a reason for *Typhonite* Eldorado's superior performance:

Eldorado's leads in each of the 17 uniform degrees are *Typhonite*. This is natural graphite smashed and demolished by typhoon centrifugal force into controlled particles of the size found best for lead making. No other drawing pencil can have *Typhonite* leads. Every draftsman works to better advantage with *Typhonite* Eldorado pencils.

PENCIL SALES DEPARTMENT 227-J12 • JOSEPH DIXON CRUCIBLE CO. • JERSEY CITY, N. J.

Don't GAMBLE!
Why take chances with new and untried truck-mixers? Play safe! Buy SMITH-MOBILE! It's the ORIGINAL High Discharge Truck Mixer, thoroughly job-tested and backed by more than 40 years' mixer building experience. Now entering its 5th year of quantity production, Smith-Mobile has won the approval of ready-mixed operators, everywhere. Hundreds of machines are giving satisfactory service and hundreds more are being re-ordered by enthusiastic users. Get the complete Smith-Mobile story. Ask for Catalog 198-A.
The T. L. SMITH COMPANY
2855 N. 32nd St. • Milwaukee, Wis.
HIGH DISCHARGE
27" to 34" higher than old-style truck-mixers. No hoist or ramp required. Pour concrete directly into high forms, buckets or carts.
SMITH-MOBILE
The Original High-Discharge
TRUCK MIXER & AGITATOR

. . . If you want to make speed profitably . . . GET DEPENDABLE EQUIPMENT . . Buy the Fast . . .
JACKSON Hydraulic Concrete Vibrator
DESIGNED TO "TAKE IT" 3 SHIFTS A DAY EVERY DAY
● Automatic pressure lubrication—requires no attention.
● 34-ft. hose—2¾" vibrator head.
● Adjustable frequency to 6800 R.P.M.—submerged in concrete.
● Powerful gas engine—4.7 H.P.
● Long-lived, ball-bearing, rotary, hydraulic pump.
USED EXCLUSIVELY BY MANY LARGE DEFENSE CONTRACTORS
ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

HARRY A. RULE, superintendent of the St. Elmo Waterworks Plant, St. Elmo, Ill., has received the first annual award for proficiency made by Illinois under standards prescribed by the state department of public health, division of sanitary engineering. The trophy was presented to Mr. Rule at the ninth annual Illinois Water Plant Operators Association conference recently held at Springfield.

A COMPLETE PICTURE of the defense construction program being carried out in Ohio under supervision of the U. S. Army Quartermaster Corps, was presented to the members of the Engineers' Club of Columbus, Ohio recently by Lt. Col. B. F. Vandervoort, fifth zone constructing quartermaster with headquarters in Columbus. At present there is approximately $300,000,000 worth of defense construction under way in Ohio, Indiana, West Virginia and Kentucky. Members on Lt. Col. B. F. Vandervoort's staff to appear on the program were Joseph L. Weinberg, Cleveland, zone architect; Maj. Bernard F. Hatch, formerly associated with Burgess & Niple, engineers, Columbus, and now a member of the engineering staff of the zone office; and M. J. O'Byrne, zone real estate director, who has had charge of acquiring and surveying several hundred thousand acres of land used in defense work in the zone. Preceding the club meeting Lt. Gen. Daniel Van Voorhis, commanding general of the Fifth Corps Area and his staff, and Lt. Col. Vandervoort and members of his staff were guests at a dinner of the control board of the Engineers' Club.

OVER 150 civil engineers gathered at TVA's Cherokee Dam near Knoxville to attend a two day meeting of the Tennessee Valley Section, American Society of Civil Engineers. Charles Okey, of TVA, was elected president of the section. Other new officers are: Jan Heykoop, vice president for the Asheville sub-section; E. L. Chandler, vice president for the Chattanooga sub-section; E. S. Fabian, of the University of Tennessee, vice president of the Knoxville sub-section; and Andrew Komora, vice president for the Muscle Shoals sub-section.

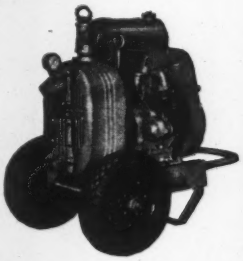
E. C. WOODWARD, Fort Worth, Tex., has been elected president of the Texas section, American Society of Civil Engineers. Mr. Woodward is a district engineer of the Texas State Highway Department. Raymond F. Dawson, professor at the University of Texas, Austin, was elected first vice president, and Conrad M. Blucher, of Corpus Christi, second vice president. John A. Focht, of the University of Texas, was re-elected secretary-treasurer for the third consecutive two year term.

SIMPLE . . .
RUGGED . . .
DEPENDABLE

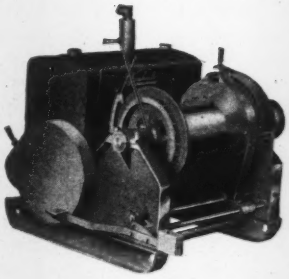
STERLING

PUMPS • HOISTS • LIGHT PLANTS

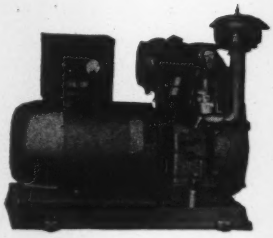
The Choice of Leading Contractors Everywhere!



There's a Sterling Pump for every job—from 1½" to 10"—and there are several models and types in each size—low head pumps—medium head pumps—high head pumps.



Sterling Hoists are offered in a wide range of sizes and types. They have been carefully designed with the thought in mind that ease of operation, lubrication and maintenance tends toward better performance.



Sterling Generating Plants are made in sizes ranging from 100 to 75,000 watts. They are fully developed and are ruggedly constructed to give long, dependable performance.

PROMPT DELIVERIES:—National Defense comes first but we have doubled our production and therefore can make prompt shipment of most orders.

★ There's a reason why leading contractors select Sterling Construction Equipment for their most important jobs.

★ Contractors everywhere have found they can do more work at less cost with Sterling Construction Equipment because

★ Sterling's Fully Developed, Thoroughly Tried and Proven Design assures *Dependable Performance.*

★ Write today for literature and prices on Sterling Pumps, Hoists and Light Plants.

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...for Defense!

In many industries and in government service, in this country and abroad . . . at work on land and at sea . . . Wisconsin heavy-duty air-cooled engines are giving a good account of themselves in today's unprecedented Defense program.

In the oil fields, helping to produce the "essential ingredient" for military mechanization; in construction work; helping to build modern "arsenals of Democracy"; on grain combines helping to harvest the nation's crops; as power for fire pumps in England's home defense . . . wherever dependable power is needed, within a power range of 1 to 35 hp., Wisconsin Engines are in there fighting . . . and doing their job well!

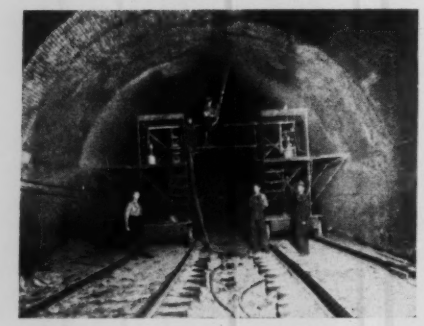
Wisconsin Engine production facilities are enlisted in Defense Service, through Industry, on an "all out" basis. POWER, properly applied in many fields, will win this war.

MOST POWER PER POUND
HEAVY-DUTY AIR-COOLED ENGINES

by WISCONSIN MOTOR CORPORATION
Milwaukee, Wisconsin, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines

A RAILROAD TUNNEL IN PENNSYLVANIA



Brick or masonry tunnel linings are quickly destroyed by locomotive gases. The photo shows "GUNITING" the tunnel of the B. & O. R. R. under the Philadelphia Art Museum. A course of brick was removed and replaced with 2" of reinforced "GUNITE". After seven years this work is still in first class condition.

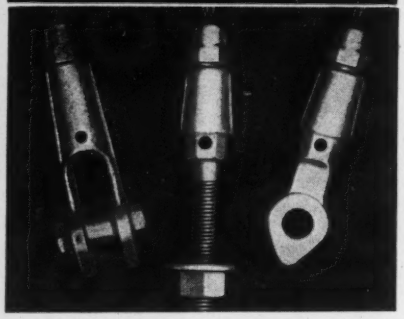
In literally hundreds of types of construction "GUNITE" is "the better way", and ultimately the least expensive. See our Bulletin No. 1200 for proof of this statement.

The "CEMENT GUN" can be bought by anyone, and used without restrictions.

CEMENT GUN COMPANY
Manufacturers of the "CEMENT GUN"
ALLENTOWN, PENNSYLVANIA

WE ARE ALSO "GUNITE" CONTRACTORS
LET US BID ON YOUR WORK

PROLONG the LIFE of WIRE ROPE with Electroline FIEGE CONNECTORS



SAFE, strong, streamlined, Electroline-FIEGE Connectors are being rapidly adopted by the Construction Industry because their design damps vibration stresses and thus prolongs the life of wire rope. This unique gripping unit "holds like a bulldog" with a graduated compression which feathers off from maximum at rear to zero at front, so that lines held by these connectors are not subject to "weak point" crystallization and consequent failure.

The complete line of Electroline-FIEGE Connectors, available in black and stainless steel, bronze, and monel metal, is fully described in a new 8-page Bulletin, a copy of which will be sent you at your request. No obligation—send for the book today.

Electroline Company
4004 S. La Salle St., Chicago, Ill.

HENRY HOLT, of Grand Forks, N. D., was re-elected chairman of the Tri-State Water Commission at a recent meeting of this organization. The commission was organized to promote water conservation in the Red River, which rises in South Dakota and forms the boundary between North Dakota and Minnesota. Among other officers elected are: E. E. Howard, Wheaton, Minn., chairman; R. L. Bard, executive secretary; John T. Tucker, of Bismarck, assistant secretary. Mr. Tucker is secretary and chief engineer of the North Dakota Water Conservation Commission. E. J. Thomas, of Bismarck, N. D., associate engineer for the North Dakota Commission, was engaged to do part time work for the commission.

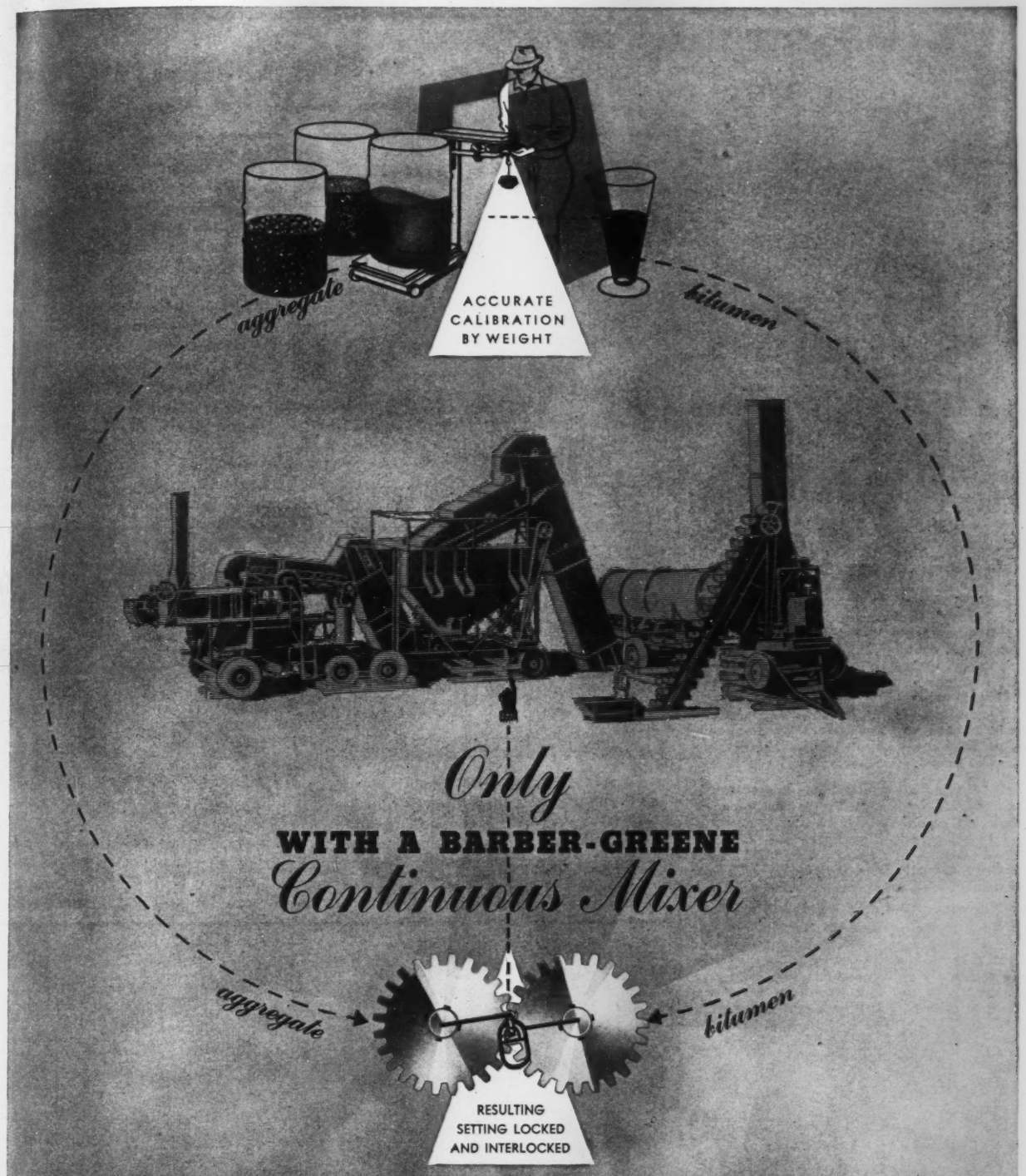
THE CENTRAL OHIO section of the American Society of Civil Engineers celebrated its 20th anniversary at a banquet held Nov. 13 at Ohio State University. Principal speaker of the evening was James E. Jagger, New York, field secretary of the national society. Officers of the Ohio Section are: C. V. Youngquist, president; C. W. Allen, first vice president; Fred E. Swineford, second vice president, and J. L. Monarchi, secretary-treasurer.

THE MAHONING VALLEY SOCIETY of Professional Engineers was host at a dinner meeting Nov. 14, at Warren, Ohio, to William Kammerer, of Cleveland, state president of the society. Luther T. Fawcett is president of the Mahoning Valley section.

WYOMING RECLAMATION ASSOCIATION, meeting at Rock Springs, Wyo. Nov. 18 re-elected H. Melvin Rollins of Cheyenne as president. Other officers elected are: J. J. Jewett, Riverton, first vice president; T. C. Tonkin, second vice president, and H. T. Person, Laramie, secretary. The 1942 convention will be held at Thermopolis.

THE ENGINEERING SOCIETY OF DETROIT, and the Detroit office of the Engineering Societies Personnel Service, Inc., moved their executive offices from the Hotel Statler to permanent headquarters in the Horace H. Rackham Educational Memorial, 100 Farnsworth Ave., Detroit, on Dec. 1.

NORMAN R. MOORE of Vicksburg, Miss., was elected president of the Mid-South section, American Society of Civil Engineers, at the annual meeting held last month at Vicksburg. R. J. Woods of Memphis was named vice president and Spencer J. Buchonan of Vicksburg, secretary-treasurer. Two new directors were elected, V. C. Anderson and Ralph Hansen, both of Little Rock. Frank V. Ragsdale of Memphis, retiring president, was named to the board of directors.



The simple procedure illustrated above accounts for the untiring accuracy of the Barber-Greene. The desired quantity of each size aggregate is weighed, and the feeder gates locked at this setting. The bitumen metering pump is set for the desired ratio, and mechanically interlocked with the aggregate feeder. The Barber-Greene achieves POSITIVE PROPORTIONING in bituminous mixing. Feeding these accurately proportioned materials into the twin pugmill in a proportioned continuous stream, the Barber-Greene easily delivers a uniform mix, ton after ton—mile after mile. The Barber-Greene has set entirely new standards for short inexpensive moving and set-up time. Investigate this ingenious machine. Complete literature on request. Barber-Greene Company, Aurora, Illinois.

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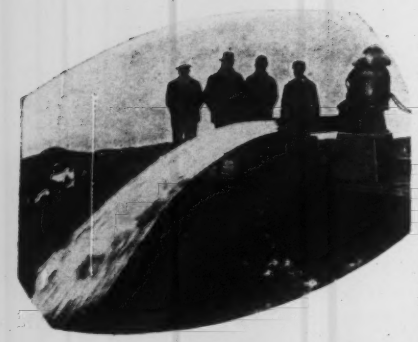
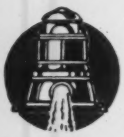


"Best Well Ever Installed"
Said Clintonville, Wisconsin

2,000,000
Gallons Daily



NEVER in its history had Clintonville, Wisconsin been able to obtain more than 250 gallons of water per minute from any of a number of their wells. The city was growing and the need for a larger supply of water was becoming urgent. Layne Hydrologists made a survey, a contract was closed and the result is a well producing 1400 gallons per minute, or over 2,000,000 gallons per day. Thus again Layne has been outstanding in success where others have failed.

Layne installed their famous gravel wall well—a type of installation that size for size and depth for depth usually doubles and often quadruples the amount of water produced from a given formation. They differ materially from the so called "gravel packed" well and are the most efficient known.

Layne can develop a new, larger and more economical well water supply for you. They can do the work promptly, thus expediting your expansion and production plans. Why not ask Layne to give you further details. For literature, address

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Layne-Western Co. of Minn.	Minneapolis, Minn.
Layne-Bowler New England Corp.	Boston, Mass.
International Water Supply, Ltd.	London, Ont.

WORLD'S LARGEST WATER DEVELOPERS

New Aids to the Constructor

Equipment and material announcements and manufacturers' news

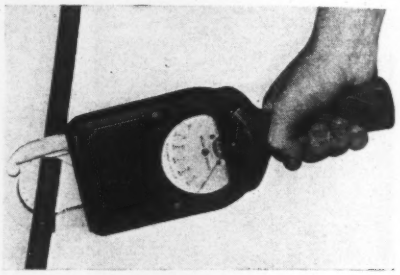
Trimming Machine

A new trimming machine is on the market particularly adaptable to trimming prints, drawings, tracing cloth and heavier materials. The machine holds the paper securely, cuts it neatly and squarely and releases it quickly, using old razor blades as the cutting medium. It is available in four sizes which will handle material up to as large as 55 in. long for trimming edges of the longest print.—*Edi Trimming Machines, 611 West 112th St., New York City.*

Asphalt Mastic Board

A new asphaltic mastic board composed of a high melting point asphalt in combination with fine mineral aggregates, sealed between dry, non-bleeding liners to provide a waterproof, rigid-nonwarping board. Both acid- and alkali-resistant, it may be formed into various shapes or corrugated. The board is available in thicknesses from $\frac{1}{8}$ to $\frac{1}{4}$ in., widths up to 50 in., and in any length desired. It is black in color and will readily take a surfacing finish. Besides use as a roofing and siding material, the board is recommended for duct work in warm air heating, air conditioning and industrial blower systems. It is used as a table-top material in messhalls at camps and in plant dining rooms.

The same company is also offering a reinforced sheet made with a center core of expanded metal laminated between sheets of asphalt mastic board. This product combines the properties of the regular mastic board, adding tensile strength of the metal core.—*Keystone Asphalt Products Co., 43 E. Ohio St., Chicago, Ill.*



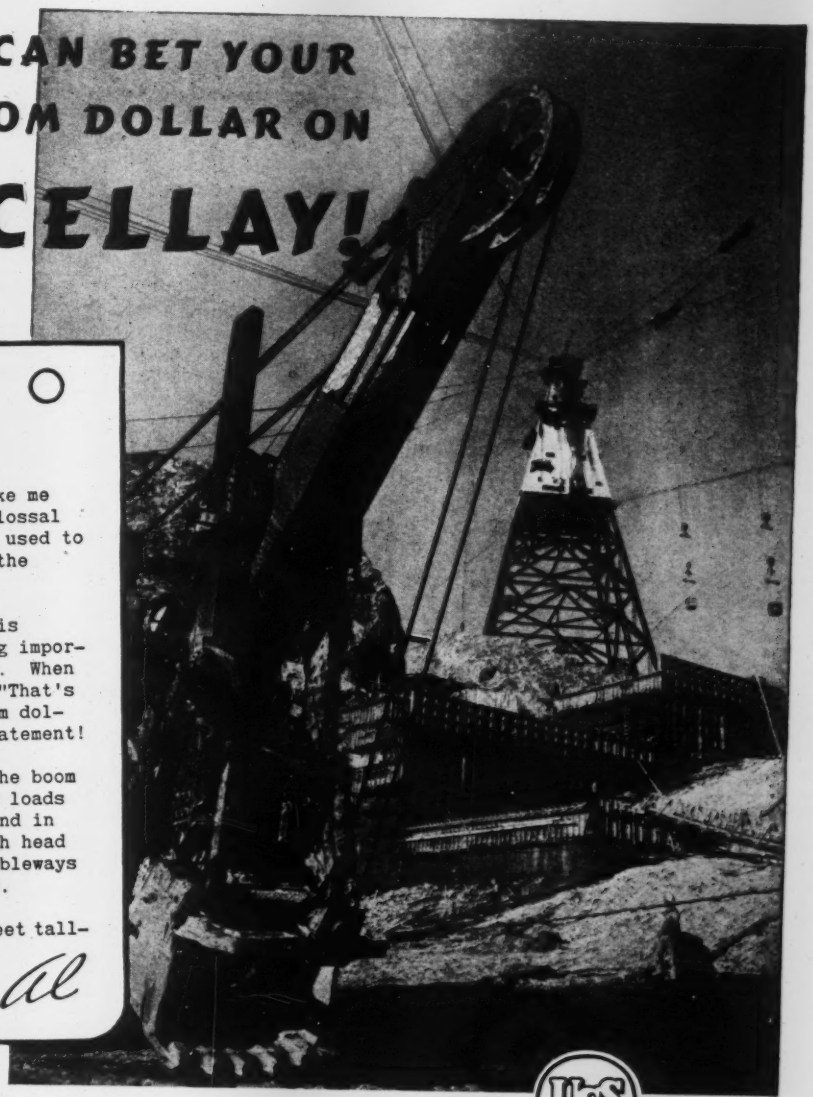
Volt-Ammeter

A hook-on type volt-ammeter, for measuring alternating current and voltage is available from G. E. Alternating current can be read instantaneously on

Trailer Scoop for Dirt Moving Drawn by Wheel Tractor

Model RS-2T Heil Hydraulic Dig-N-Carry Trailer Scoop (8 yd. capacity) tractored by Model K-8 cab-over-engine International Harvester unit, rolled up hourly output capacities estimated as ranging from 31 yd. for a 6,000-ft. haul one way to 120 yd. for a 1,000-ft. haul. The trailer scoop is 22½ ft. long and has a cutting edge length of 90 in. that takes a maximum depth cut of half a foot. Ground clearance in the carrying position is 14 in.—*The Heil Co., Milwaukee.*

YOU CAN BET YOUR BOTTOM DOLLAR ON EXCELLAY!



A WIRE ROPE ENGINEER REPORTS TO HIS BOSS

Boss -- the operations out here make me dizzy! Gigantic, stupendous and colossal are just weak understatements when used to describe any phase of the work on the mighty Shasta Dam Project!

And American Tiger Brand Excellay is really doing a noble job by keeping important equipment running on schedule. When operators on a job like this say, "That's good rope," you can bet your bottom dollar they're not making any idle statement!

This picture is a honey — shows the boom of an electric shovel whose dipper loads 6 tons of material at one scoop, and in the background is the 460-foot high head tower which supports the 7 long cableways that deliver concrete to the forms.

By the way, the head tower is 25 feet taller than a 31-story building!

al

A GOOD way to get good service out of your wire rope is to take full advantage of the wide experiences of American Tiger Brand Wire Rope Engineers. Our field engineers are interested in seeing that you get a full dollar's value out of every dollar you invest in wire rope. That's why you'll find them right out where the rope is used—that's where they spend most of their time. There's no better place to keep in touch with wire rope performance.

These engineers are well qualified to give you exactly the service you need—speedily, too! Besides helping you to select the most practical wire rope for a particular job, they can often give you valuable, money-saving tips on operation. And there's no obligation.

American Tiger Brand Wire Rope is made in all constructions and grades. Call on one of our engineers to help you specify the types best suited for your job.

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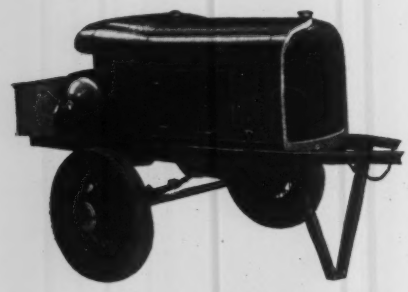
A utility company in Pittsburgh uses 31 Smith Compressors. Words of praise come from users everywhere. These are typical: "I am very well pleased with my compressor. I believe it is one of the best pieces of equipment I have ever bought." Signed, A. R. Welsch, Contractor, Joliet, Ill.



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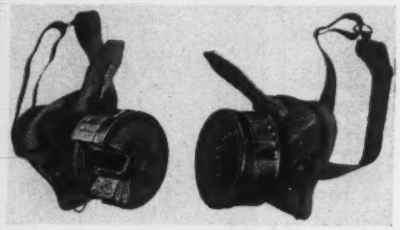
both insulated and non-insulated conductors simply by hooking the instrument around the line. For voltage readings, it is necessary only to connect two leads furnished with the instrument and then flip the thumb-manipulated selector switch to the desired voltage position on the scale. Four current ranges are available 0 to 15, 60, 150, and 600 amperes; and two voltage ranges, 0–150 and 0–600 volts are available at the setting of a six-position snap switch. The device can be quickly and easily used by non-technical help. To make measurements, the transformer can be pulled open and placed against the conductor, following which a slight push on the handle snaps the transformer shut. Measurement completed, a gentle pull springs open the dovetail joint of the transformer and releases the conductor.—*General Electric Company, Schenectady, N. Y.*



Respirator

A new respirator which affords maximum protection against the inhalation of pneumoconiosis-producing and nuisance dusts, has been approved by the U. S. Bureau of Mines and is now on the market. It is said to be more compact, lighter, easy to breathe through, more comfortable to wear, and easier to clean and maintain than previous models. A scientifically and compactly designed cartridge provides more than 41 sq. in. of breathing and filtering area. The filter is cleaned by blowing accumulated dust from the vanes with an air dusting gun or nozzle, thus maintaining peak performance and requiring less frequent replacement. Known as the "M S D" respirator, it is available from—*DeVilbiss Company, Toledo, Ohio.*

Hydrated Lime

Said to be the first lime to meet the rewritten federal specifications designed to eliminate troubles with finish coats that have been reported in post offices, a new type of hydrated lime is now on the market, known as USG Hydrated Finishing Lime. An outstanding property of this new lime, as far as builders and plasterers are concerned, is the fact that it eliminates the necessity of soaking. It may be dumped into the water in the mixing box, given 15 to 20 minutes to absorb the water, and then mixed and immediately used. There is no change

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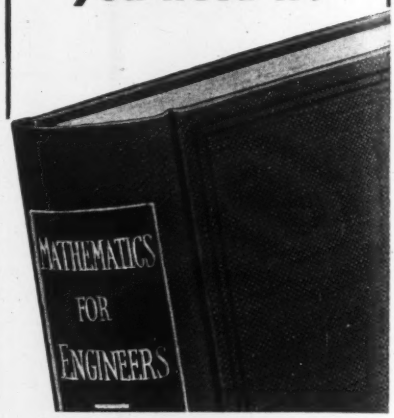

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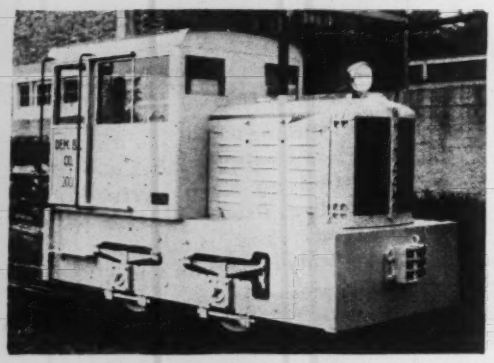

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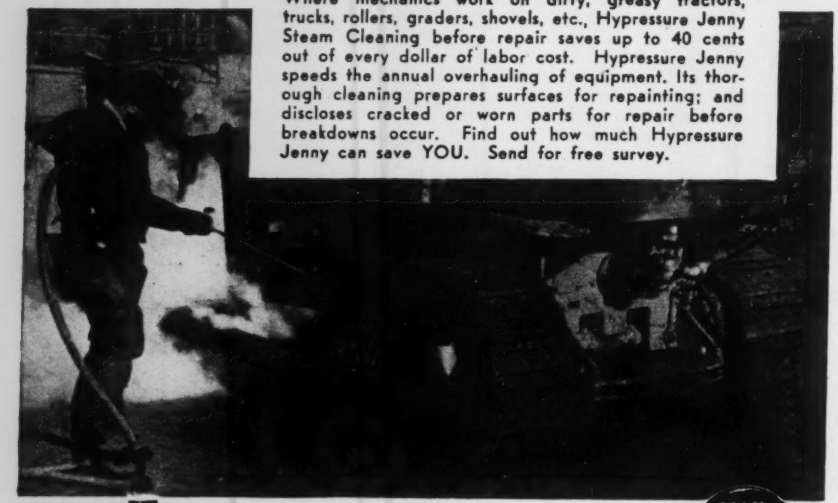

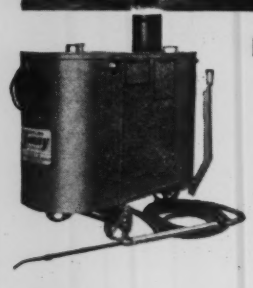

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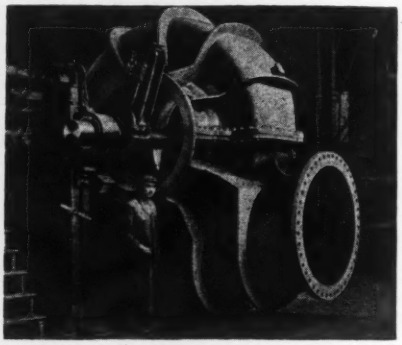
in the gauging procedure or quantities required with the new lime. On patch work it has the advantage of use without the muss which ordinarily results where the putty must be mixed and let stand overnight.—*United States Gypsum Co., Chicago, Ill.*

Service Pipe

To relieve the shortage of galvanized pipe and copper tubing, the Hill-Hubbell process is now being made available in "Shatterproof" steel service pipe. Factory processed coatings are available in sizes from ¾ in. to 1½ in. with special interior cement linings. Regular water works enamel linings and coatings are available in sizes from 2 in. and up. This new "S-P" steel service pipe embodies the same shatterproof features which have been available previously in steel watermains in sizes from 4 in. to 30 in.—*Hill, Hubbell & Co., Cleveland, Ohio.*



Pumps

The 54-in. pump shown above has a capacity of 130,000 gpm against a dynamic head of 20 ft. and will be set as a vertical shaft outfit for unwatering a Navy drydock at Pearl Harbor, Hawaii. The pump will be set 60 ft. under water and will be operated at 277 rpm by 1,250 hp. motor.—*Morris Machine Works, Baldwinsville, N. Y.*

Mobilcrane

Fifteen and 20-ton Mobilcranes have been on the market for some time and are now joined by the Model 205WM Mobilcrane which is of the 6-ton class. This machine was developed to fulfill the need for small, mobile units, which will travel quickly from job to job, be easy to handle on the road and at work, be operated by one man and powered with but one motor. The Model 205 WM has a wide range of speeds for traveling, has hydraulic steering, mechanical hydraulic brakes on rear wheels, and other features that lend to its mobility and usefulness as an excavator and material handler. A Clark truck-type transmis-

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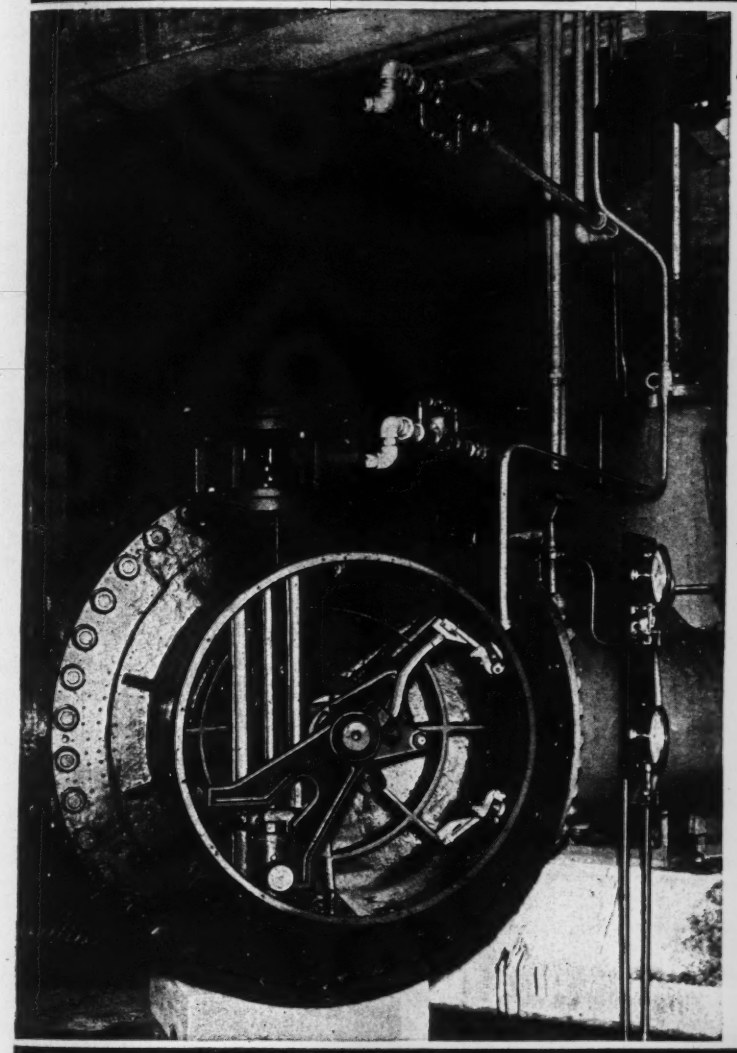

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For many important applications in water supply and sewage disposal service, the Chapman Automatic Cone Valve is the most efficient and economical valve we know of. This plug-type valve, with its pipe-line waterway, self cleaning seats, and unique operating mechanism, is equally efficient for air, water, gas or sewage. It is built in sizes from 6″ to 48″ for manual, hydraulic or electric operation, with various types of automatic control. For such uses as stop-check, altitude and liquid level control, pressure regulating, etc., the Chapman Automatic Cone is the outstanding valve in this field.

At left:
Chapman Automatic Cone Valve Sewage Pump Discharge Check Showing Operating Mechanism

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4—INCREASES FINAL STRENGTH—National Bureau of Standards and P. C. A. tests show calcium chloride increases ultimate strength from 7 to 12%.

5—ADDS EXTRA PROTECTION—Solvay Calcium Chloride in the mix gives *extra* protection against frozen concrete by speeding set and increasing early strength!

6—PROVIDES DEPENDABLE CURING—Assures positive, uniform curing in all concrete, including paving, structural and products.

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8—PERMITS LESS FORMS—Earlier release of forms permits quick reuse . . . fewer needed.

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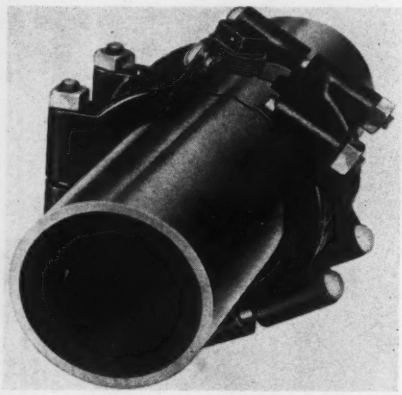
sion is provided on the deck, driven by roller chain, and powered through a Lipe clutch. The deck transmission is arranged with four speeds forward and reverse. The chassis transmission is mounted between the frame I-beams, and has a three point suspension to prevent operating strains from being imposed upon the case. Through the speed change gears in this transmission, two additional speeds are available, giving a travel range from .86 miles per hour to 10 mph. Screw jacks are provided on the rear bumper plates to relieve the tires of excessive load when making heavy lifts. Outriggers are provided for working over the side.—*The Osgood Co., Marion, Ohio.*



Pipe Repair Sleeve

Embodying a new principle of design, Dresser's adjustable repair sleeve, Style 82, fixes breaks, holes, and splits in straight runs of cast-iron pipe, without service interruptions, by enclosing the defective pipe in a pressure-tight chamber. Low in first cost, adjustable to fit varying pipe diameters, and permanently tight, this repair sleeve is said to save time, money and trouble for maintenance men. It consists of three individual sections, each complete with one side gasket and two end gaskets assembled in place at the factory. The rectangular rubber-compound gaskets fit into a deep recess, preventing gaskets from coming out of position while sleeves are in stock or during installation. The three sections are assembled into a complete sleeve with six side bolts. Tightening them gives full compression on all gaskets while an escape vent facilitates installation under pressure. The three sections used for assembling a complete sleeve may be varied to exactly match the size of pipe. A diameter finding tape, included with each sleeve, tells the combination of sections to use. A tight pack may be made on pipe offset as much as $\frac{5}{8}$ in. The adjustable repair sleeves are recommended for working pressures not exceeding 150 lb. per sq. in.—*Dresser Mfg. Co., 41 Fisher Ave., Bradford, Pa.*

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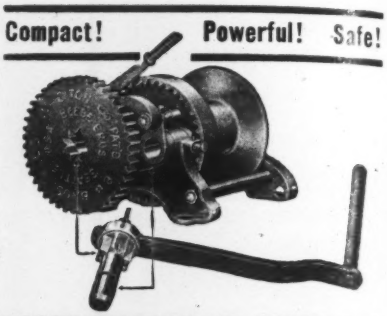

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NEW PUBLICATIONS

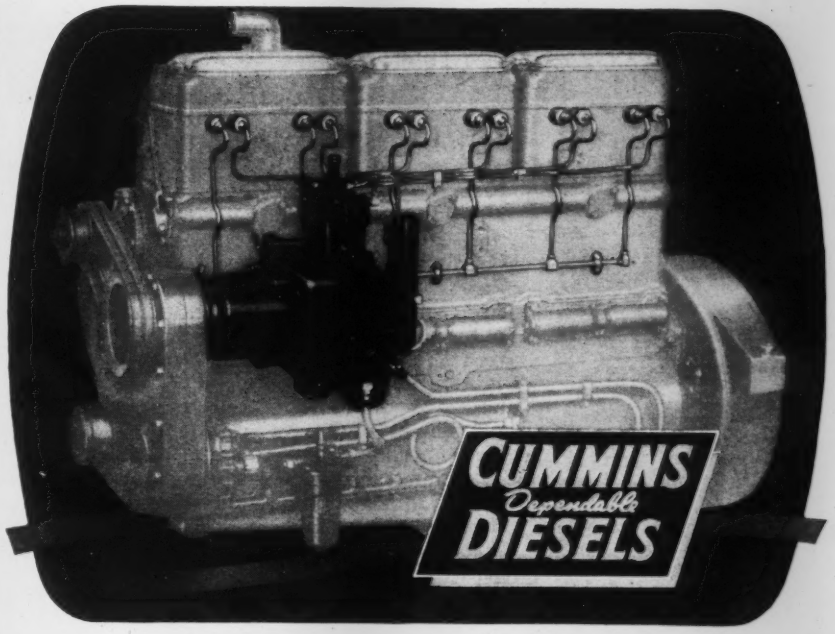
Cooling Water—A comprehensive text on scale, corrosion and living organisms in cooling system operation is represented by a new 46-page booklet of reprints of significant published articles on this subject. It is said to contain, for the first time in the English language, a complete discussion of the water problems inherent in cooling system operation.—*D. W. Haering & Co., Inc., 205 West Wacker Drive, Chicago, Ill.*

Pumps—"Propeller Pumps for Biofiltration Plants" is the subject of a new catalog which describes F-M mixed flow propeller pumps in the Figures 6310 and 6360 series which are admirably adapted for this service. The recirculation which is a distinctive feature of the process supplies the means whereby the liquid is rapidly passed through the filter bed in addition to being retained in the tank for the required period of oxidation. Ask for Bulletin 6301.—*Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.*

Skylights—A 16-page booklet describing skylights by Fisher is issued as a guide and handbook for architects, engineers and plant directors which gives salient facts connected with the construction of Fisher skylights. Detailed sketches give full information on physical details, ridged and eaved assemblies as well as pertinent data on ventilating skylights.—*J. J. Fisher Co., Inc., 186 Fifteenth St., Brooklyn, N. Y.*

Higher mathematics—Aid for computers is offered in "A new method of making such calculations as those occurring in solving stresses in indeterminate structures, undamped vibration, deflection, forced vibration with dissipation, certain vibration problems involving gyroscopic action, and in least squares processes." This material is in a reprint of a paper (with explanatory guide) by Dr. Prescott D. Crout, under the title "A Short Method of Evaluating Determinants and Solving Systems of Linear Equations With Real or Complex Coefficients." The reprint will be sent upon receipt of 6c. in stamps.—*Marchant Calculating Machine Co., Oakland, Calif.*

Drives—A full description of A-B Texsteel and Texdrive sheaves, steel and cast iron sheaves for Texrope drives in sizes under 25 hp., are presented in a new bulletin B 6047, just issued. Handy tables in the book give available sizes, dimensions and prices. Texrope Super-7 V-belts are described.—*Allis-Chalmers Manufacturing Co., Milwaukee, Wis.*



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The Cummins Diesel's outstanding record is a perpetual demonstration of the value of the *Exclusive Cummins Fuel System* . . . without it, the Cummins Diesel would be just another diesel. But because it is fundamentally different from all other fuel systems . . . every Cummins Diesel owner enjoys these three *exclusive* advantages:

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3. *Efficient service* because neither pump nor injectors need be sent to the factory for overhaul . . . but can be serviced in the field by a competent mechanic with the aid of the Owner's Manual.

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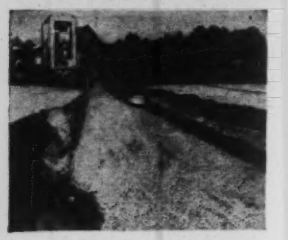
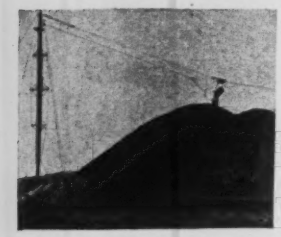
Cummins Engine Company • Columbus, Ind.

Sauerman LONG RANGE MACHINES



Sauerman Drag Scraper loading pit-run gravel into trucks.



Sauerman Slackline Cableway dumping spoil onto high pile.

Dig and Haul, Store and Reclaim Any Capacity up to 1000 t.p.h.

Long reach, simplicity, low cost operation and adaptability to any ground conditions are features of SAUERMAN Power Drag Scrapers and Cableway Excavators that recommend these machines for a variety of digging jobs and the handling of all kinds of bulk materials.

Because of their unique design these machines require a minimum of equipment, making it extremely practical to set them up at inaccessible places. With few moving parts to get out of kilter, a small replacement inventory insures steady operation.

Write for our catalog and see for yourself how others have cut costs on hundreds of tough jobs with Sauerman Machines.

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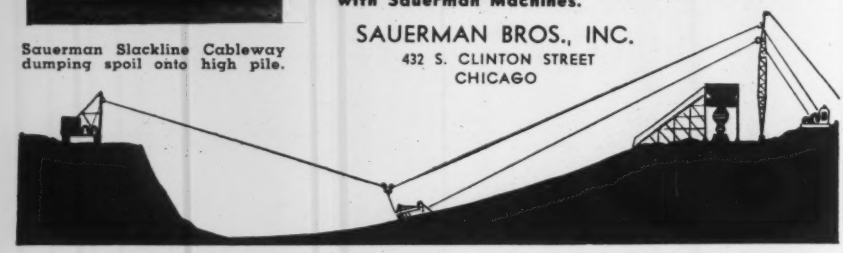
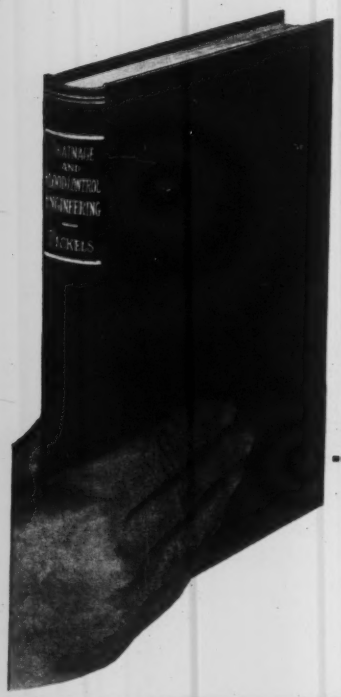


How to design drainage and flood control projects



Now . . . the tested results of latest, outstanding research in land reclamation by drainage are made handy for you in this new manual. Leaving nothing uncovered that is of proven, substantial help, this practical book brings you up-to-the-minute data to make your work easier and assist you in every phase of drainage and flood-control engineering.

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The fundamental sciences of hydrology, hydraulics and soil physics — particularly the results of latest researches — are soundly covered from the specialized viewpoint of the drainage and flood-control engineer. Flood control is treated in a practical manner with especially thorough information on channel improvements, bank protection, levees, and reservoirs. The subject of routing floods through reservoirs and rivers is concisely presented, and the treatment of stream straightening is particularly valuable and useful. The book contains much valuable data on the intensity, frequency and distribution of storms.

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Priority—"Priorities Procedure" to assist you in purchasing equipment for plant maintenance and repair is the title of a compiled series of helps for use in securing needed materials.—*Wallace & Tiernan Co., Inc., Newark, N. J.*

Rail Clamps—"Rail Clamps for Movable Structures," Bulletin No. 114, describes and illustrates in color the various types of rail clamps available for heavy equipment such as bridges, towers and traveling cranes. Manual and power operated single and double rail clamps are described and fully illustrated in color.—*Robins Conveying Belt Co., Passaic, N. J.*

AISI—SAI—Because the American Iron and Steel Institute Standards are recognized as here to stay, industry finds itself struggling with the interpretation of the new standard AISI steels in terms of the old SAE. Most timely and helpful is a pamphlet published by Ryerson comparing the two systems of steel identification. The booklet contains all the latest official data for both of these new systems of identification with direct comparisons of the equivalent or alternate steels given in quick tabular form.—*Joseph T. Ryerson & Son, Inc., P. O. Box 8000A, Chicago, Ill., and all principal cities.*

Stop Nuts—A colorful, informative and readable catalog describes elastic nuts for all kinds of fastenings where vibration is a problem. Specifications and list prices for the equipment are given.—*Elastic Stop Nut Corp., 2330 Vauxhall Road, Union, N. J.*

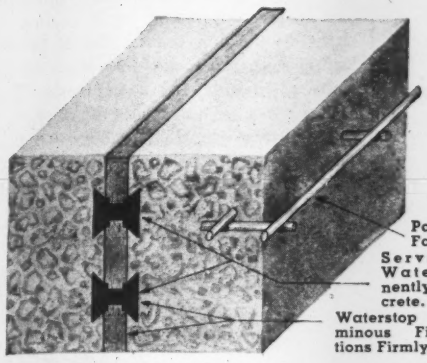
Cletrac—The 25th anniversary of the Cleveland Tractor Co. is featured in the current issue of *Cletra Facts* which pictures early models of the famous tractor line and honors long service employees of the company.—*Cleveland Tractor Co., Cleveland, Ohio.*

Clay Pipe—A folder emphasizes the fact that clay pipe can be shipped today, no delays, no red tape, and no priorities. Also featured is the 50-year guarantee on vitrified clay pipe.—*Clay Sewer Pipe Association, Oliver Bldg., Pittsburgh, Pa.*

Arc Welding—"Practical Lessons in Arc Welding," by W. J. Chaffee, 100 pages, 77 illustrations, is available in the seventh printing of the third edition. Price 50 cents, special edition written in Spanish, $2.—*Hobart Bros. Co., Troy, Ohio.*

Welding Procedure—Clarifying the proper welding process for a particular metal under various circumstances a

WATER-TIGHT EXPANSION JOINTS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Waterstop and Bituminous Fiber Sections Firmly Attached.

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The Servicised Waterstop Expansion Joint will prevent the infiltration of water and foreign matter during periods of concrete slab contraction or expansion. Period of concrete slab contraction is generally a very critical stage as this is the time when the joint crevice generally becomes exposed and water, pebbles, and so forth get into the crevice and do their destructive work. An examination of the illustration in the upper left-hand corner of this page will explain to you how the waterstop lobes of the Servicised Waterstop Expansion Joint tend to prevent water from seeping into the joint crevices and thus eliminate washing out of the road bed. A positive seal is maintained whether the slabs are expanded or contracted.

PARA-PLASTIC *Hot Poured Rubber Sealing Compound*

This product is designed to assist the engineer and contractor to produce water-tight joint crevices when they are employing non-extruding types of joints. The plastic, cohesive, and adhesive qualities of this material when poured 1" to 1½" in depth at the top of the joint crevice keeps your joint crevices filled and water-tight at all times. The picture in the lower right-hand corner of this page illustrates the most popular application of Servicised Hot Poured Rubber Sealing Compound.

SERVICISED FIBER EXPANSION JOINT WITH POURED PARA-PLASTIC SEAL.

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There is no shortage of lumber; it is reasonable in cost; it may be fabricated quickly; it may be obtained readily in all parts of the country **without priority orders.**

To help you design and build with **Douglas fir lumber** the Engineering Department of the West Coast Lumbermen's Association has prepared the second in its **Blue Ox Series** of specimen plans—"Flat Top Roof Trusses." Included in this 20-page bulletin are specimen designs . . . . and bills of material for spans of 40, 60, 80 and 100 feet. Determining design factors are discussed and suggested framing and bracing details are given—also sample analysis of timber connector joints.

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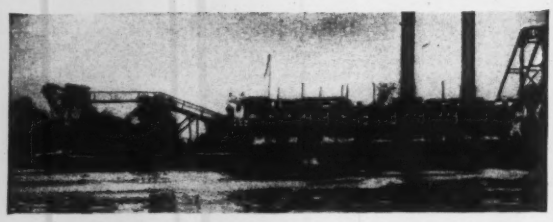
364 STUART BUILDING SEATTLE, WASHINGTON

DREDGING



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clearly written, conveniently grouped, 55-page book, "Welding Procedures," has just been published by Airco. In addition to recommending process, the book recommends the best filler metals to be used for each process, and describes specialized welding techniques not commonly known. In an appendix, data is given for the calculation of electrode and gas welding rod consumption for different types of welds; also comparative welding record sheets for tabulating data that will determine the best welding method for a particular job.—*Air Reduction Sales Co., 60 E. 42nd St., New York.*

Floodlighting—For night time production and protection in outdoor areas near manufacturing buildings, and for construction projects, recommended floodlighting practice is described in a new 22-page bulletin. Positions for lighting fixtures relative to ground and buildings are shown by drawings for many applications. Application data give floodlight types, locations, spacing, and mounting type. Ask for Booklet B-2280.—*Westinghouse Electric & Mfg. Co., Cleveland, Ohio.*

Odor Adsorber—A two color, four page bulletin describes the new portable Dorex Type A odor adsorber designed to remove all odors in small areas. It purifies 100 cu.ft. per min. using the same adsorptive medium as the poison gas mask.—*W. B. Connor Engineering Corp., 114 East 32nd St., New York.*

Concrete Heating—A folder describes flame concrete heaters and water heaters for construction materials.—*Littleford Bros., 457 E. Pearl St., Cincinnati, Ohio.*

Air Control—A new catalog describes a new line of industrial products for use in the control of compressed air. It is unique in a great number of new fittings and complete air operated machine control sets it contains which may be tailored to fit all types of machines. These new controls make it faster and safer for the operator to feed and operate the equipment, at the same time reducing fatigue to a minimum.—*A. Schrader's Son, Brooklyn, N. Y.*

Portable Forges—A bulletin describes Hauck portable forges either oil or gas burning for rivet heating, blacksmithing, etc. These outfits are designed to take directly to the job for quantity production on all sizes of material. This bulletin shows the complete Hauck line and features the blacksmith forges which are a new addition.—*Hauck Mfg. Co., 124 Tenth St., Brooklyn, N. Y.*

Manufacturers' Activities

ROBERT T. HARRIS has been appointed vice president of Blaw-Knox Division in charge of the construction equipment department, BLAW-KNOX CO., Pittsburgh, Pa.

FLEXIBLE STEEL LACING CO. of Chicago, manufacturers of alligator steel belt lacing, Flexco H.D. belt fasteners and allied products, have announced the appointment of JOHN P. RAMSEY as factory sales representative for New York and the New England States. This territory was formerly covered for the Flexible Steel Lacing Co. by H. IRWIN REINHORN, who is now with the TON-TEX CORP. of New York City.

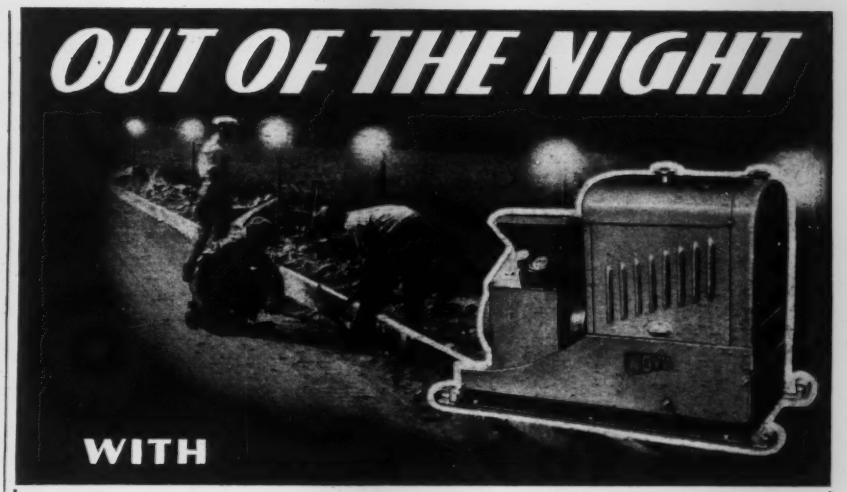
D. J. SHELTON, former vice president of the MARION STEAM SHOVEL CO., Marion, Ohio, has been elected president and general manager to succeed J. H. WATTERS, who resigned to accept the presidency of the UNION ASBESTOS & RUBBER CO. of Chicago but will continue to serve as a member of the board of directors of Marion. Mr. Shelton has been with the company for 32 years. One of his first appointments was to place JOHN P. COURTRIGHT, sales manager since 1937, in full charge of Marion's sales as director of sales.

E. C. BOLTON has been appointed district manager of the Cincinnati district sales office of CUTLER-HAMMER, INC. Mr. Bolton has been with the company since his graduation from Carnegie Institute of Technology in 1922 and has had his headquarters in Chicago for the past 16 years.

JESSE H. LIDE has been appointed assistant general advertising manager of the WESTINGHOUSE ELECTRIC & MFG. CO. and will be located at the company's Pittsburgh headquarters. Since September Mr. Lide has been assistant advertising manager of the merchandising division at Mansfield, Ohio.

P. G. BOYD has been appointed district sales manager for YOUNGSTOWN STEEL PRODUCTS CO.'s newly established Washington district, which includes the District of Columbia, the northeastern section of North Carolina, and the state of Virginia except Bristol. The new office is located at 920 Shoreham Building, Washington, D. C.

AMERICAN ROLLING MILL CO. has been asked to build a three-furnace electric steel plant, costing $554,000 at Middletown, Ohio, and a Bessemer converter, costing $842,000 at the Ashland, Ky.,



NOVO LIGHT PLANTS

NOVO LIGHT PLANTS will stretch your day to 24 hours. Unfailing, Unflickering light for the night shifts and a dependable source of power for small electric tools.

They have heavy duty, long life gasoline, gas or diesel power units—modern design, generator and engine are close coupled, switch board has weather proof cover, circuit breaker is used instead of fuses and open switch.

They are built in D C and A C models from 1 to 10 K W. Self starting and remote control available. Send the coupon.

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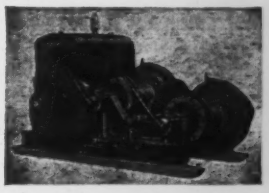
From 1½ to 8" sizes with big capacities, self-sealed design and 2 wear plates for easy adjustment.

NOVO DIAPHRAGM PUMPS
The old faithful of the dewatering pumps with a new, compact design, will handle Mud, Sand, Trash and Seepage—3" and 4" sizes.



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division. Construction of the plants will be financed by the Defense Plant Corporation and they will be leased and operated by Armco.

McCLUNG-LOGAN EQUIPMENT CO., distributors for Allis-Chalmers, Northwest, and Rex equipment in Maryland and Delaware, has opened an office in the District of Columbia at 13th and M St. NW, under H. G. GREEN.

CARL W. MILLSOM, JR. has been appointed to the post of Airtemp district manager for Western New York state. Mr. Millsom will make his headquarters in Jamestown, N. Y., taking over the duties of WILLIAM DENNISON, who has been advanced to the position of Airtemp regional manager of Texas. WILLIAM R. GROVES has been appointed district manager for Airtemp, making his headquarters in Atlanta, Ga. Mr. Groves was recently associated with the WESTINGHOUSE ELECTRIC & MFG. CO. in the merchandising division.

W. B. SIMONS, Charlotte, N. C. has been appointed representative for Cochrane flow meters in the Carolinas, according to announcement from COCHRANE CORP., Philadelphia. Mr. Simons also handles the products of HAYS CORP., SPENCE ENGINEERING, CUNO ENGINEERING, WILLIAMS GAUGE, and the HENSZEY CO.

PIONEER ENGINEERING WORKS, INC., of Minneapolis, Minn., manufacturers of mine, quarry, and gravel pit machinery, have announced the appointment of the following new distributors: The E. F. CRAVEN CO. of Greensboro, N. C. for North Carolina; JAMES RAY NORTON, 11 W. 42nd St., New York, for New York state.

The Wickes Simplex blue printing machines are now being distributed in the New York metropolitan district by the JOHN R. CASSELL CO. INC., 110 W. 42nd St., New York City. The manufacturers are located at Saginaw, Mich.

CHAIN BELT CO. of Milwaukee has announced the appointment of A. W. THOMAS as sales manager of the construction machinery division, succeeding B. F. DEVINE, recently promoted to manager of that division. D. A. KALTON has been advanced to assistant sales manager and A. J. FRANK to assistant to the manager of the construction machinery division. All have been connected with the company for many years and have had extensive experience in the construction machinery field.

W. P. CHILDS, 845 Memorial Drive, S.E., Atlanta, Ga., has been appointed representative in that area by PROGRESSIVE WELDER CO. of Detroit, to handle the company's line of resistance welding equipment.

NEED WATER? RANNEY METHOD Provides LARGE QUANTITIES AT LOW COST

Left: Water flowing into a Ranney collector (See Fig. 1 below) through one of the portholes from which horizontal screen pipes extend radially into the water-bearing formations at selected levels for distances up to 300 feet (Fig. 2).

The Ranney Method of Water Collection is the only complete, self-contained, centralized system for producing large quantities of water with the following advantages:

1. Centralized installation.
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3. Low operating and maintenance cost.
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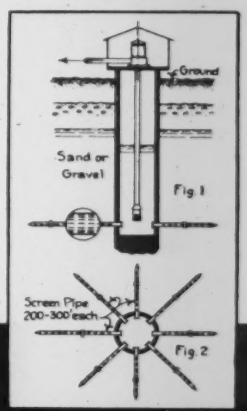
7. Permanence of structure.

Let us show you how the Ranney System has solved industrial and municipal water problems in many sections of the country.

Write today for our descriptive pamphlet.



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In airports, ordnance plants, munitions plants, camps, and industrial plants, your Uncle Sam is depending on Smith Valves, Hydrants and other items of Water Works Equipment to get the job done without delay, trouble or undue expense. So please pardon any delay you may experience should you order Smith Equipment—the big job comes first and, that done successfully, all the rest will take care of itself! Meanwhile why not study our Catalog?

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Hangar No. 1 Washington National Airport • Washington, D. C.

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THERE'S NO "DOOR DELAY" when they roll the ships in or out of the hangars at the new Washington National Airport, Washington, D. C. • Free, smoothly-flowing action is assured by the use of TRUSCON Electrically-Operated Straight-Slide Hangar Doors, as illustrated. • TRUSCON Straight-Slide Doors are the simplest types of steel doors used for hangars, and are adaptable to both large and small openings. The overall opening in the Washington National Airport Hangar is 176 feet by 30 feet, and is covered by eight sliding leaves. • Where planes constantly are moving in and out, and where heat conservation is a factor, use TRUSCON Electrically-Operated Straight-Slide Hangar Doors. They are described in the 80-page Truscon section in Sweet's . . . Individually-bound copies of this material are available for your personal use. • And when you want extra help for unusual jobs, there's always TRUSCON engineering service that will work with you *right on your board!*

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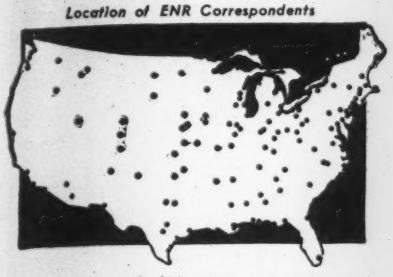
Location of ENR Correspondents



Symbols and Abbreviations Include:

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply — Unclassified
Sewers, Waste Disposal — Latin America
Bridges, Grade Cross'gs — Public Buildings
Streets & Roads — Commercial Buildings
Earthwork, Waterways — Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR):

LOW BIDDERS: All low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

WATER SUPPLY

PROPOSED WORK

Colo., Denver — Denver Municipal Water Works, City and County Bldg., 30 in. I.D. concrete or steel pipeline (water), replacement of existing wooden conduit. $300,000. D. D. Gross, City and County Bldg., engr.

Ill., St. Elmo—Will not construct water reservoir. $50,000. Project abandoned. T. R. Harris, Decatur, engr. CD 10/29 under BA—ENR 9/11, under PW.

O., East Palestine—Drilling 3 new wells, installing necessary pump. equip. $17,000-$20,000.

†Okla., Dawson—City, bond election Dec. 9, additional watermain extens., Docket Okla. 34-137. $33,000. **DPW.** Craig & Wood, Philtower Bldg., Tulsa, engrs. CD 11/14—ENR 11/20.

Okla., Pryor—WW exten., sanitary sewers, sewage disposal plant. $250,000. Applied to DPW. R. Collins, McAlister, engr. CD 10/23—ENR 10/30.

Okla., Salina—Water sys. exten. $75,000. Applied to DPW for gr. H. T. Lawrence, 3244 NW 14 St., Oklahoma City, engr.

Pa., McKeesport—G. H. McNutt, dir. Water Dpt., Peoples Bank Bldg., preliminary plans WW imprvs. and addn., incl. feed lines, river intakes, storage reservoir, Proj. Pa. 36-137. $425,000. Chester Engineers, 210 E. Parkway N.S., Pittsburgh, engrs.

Tex., Bloomington—Voted bonds WW sys. $30,000.

Tex., Brownsboro—Voted $35,000 bonds, WW and sanitary sewerage sys.

Tex., Corpus Christi — A. C. McCaughan, mayor, voted bonds WW sys. $200,000. Applying for DPW funds. Myers & Noyes, c/o Tower Petroleum Bldg., Dallas, and Corpus Christi, engrs. G. Blackburn, city engr.

Tex., Edinburg — A. A. Aldrich, mayor, purch., imprv. WW sys. $325,000.

Tex., Nederland—J. H. Goodwin, mayor, voted $60,000 bonds WW sys. H. L. Thackwell, 209 E. Cotton St., Longview, engr.

Tex., Terrell—P. I. Austin, city mgr., WW imprvts. $63,700. Applied for DPW funds. Albert C. Moore & Co., 2404 Smith-Young Tower, San Antonio, engrs.

Tex., Tomball—O. G. Segar, mayor, WW sys. imprvs. $25,000. Applied for DPW funds. Garrett Eng. Co., 3504 Audubon St., Houston, engrs.

Tex., Victoria—Victoria County Water Control & Imprvt. Dist. 1, voted $15,000 bonds WW imprvs. E. F. Miles, Victoria, engr. CD 9/4—ENR 9/11.

Va., Abingdon — Washington Co. Sanitary Dist. 2, Abingdon, voted $150,000 bonds, water supply sys. exten. from White Top Mountain.

Wash., Paulsbo—Water and sewer imprvs. $123,255. Seeking DPW funds.

B. C., Saanich—Municipality, election Dec. 13, to vote on construction 2 reservoirs. $350,000. H. H. Allen, Town Hall, engr. CD 8/13—ENR 8/21.

Ont., Hamilton—Bartow Twp., Hamilton, 7 mi. watermain, etc. $30,000. Dpt. Munitions & Supply, Ottawa, engrs.

Ont., Ottawa—Secy. Dpt. Munitions & Supply, Ottawa, bids soon installing 7 mi. watermain from Hamilton city limits to Mount Hope Airport, for Dpt. National Defense for Air, Ottawa. $50,000.

Ont., Toronto—James, Proctor & Redfern, engrs., 36 Toronto St., bids soon filtration plant exten. and coagulation basin, Everest Rd., incl. new filters and pumps, for Scarboro Twp. Public Utilities Comn., 1666 Kingston Rd. About $60,000.

Ont., Windsor — Utilities Comn., J. Clark Keith, genl. mgr., Canada Bldg., 18 in. c.i. main from Walker Rd. pumphouse to Wyandotte St., and 12 in. c.i. main, Seminole St. $32,325. J. C. Keith, engr.

Que., St. Joseph de Sorel—Municipality, c/o E. Paul, treas., water conduits, etc. $30,000. M. Marchand, Town Hall, engr.

BIDS ASKED

Bids Asked December 9

†Mo., Fort Leonard Wood—Con. Q.M., Fort Leonard Wood, approx. 17,600 ft. 6 in. water line, etc.; adv. ENR 12/4.

N. J., Newark and Belleville—City of Newark Water Dpt., City Hall Annex, Newark, cleaning interior surfaces and lining with protective coating cement-mortar, 13,000 ft. 36 in. c.i. No. 5 Aqueduct, Bloomfield Ave. Tower, Newark to Belleville Reservoir, Belleville, W. Banks, City Hall, Newark, engr.

Bids Asked December 12

N. J., Union—Union Co. Park Comn., Administration Bldg., Acme and Canton Sts., Elizabeth, artesian well, Galloping Hill Park, W. R. Tracy, Acme and Canton Sts., Elizabeth, engr.

Bids Asked About December 16

Ill., Mackinaw—Town Clerk, WW imprvs. $15,000 Kinsey Eng. Co., Pekin, engrs. CD 8/25—ENR 8/28.

†Tex., Freeport—U. S. Eng., Federal Bldg., drilling 2 water wells, intersection Intercoastal Waterway and Brazos River, near here.

Bids Asked December 22

†Conn., Hartford — Bd. Contr. & Supply, Metropolitan Dist., R. Dillon, clk., 550 Main St., Contr. 72, Reservoir 6-Fern St. cross-connection lines; adv. ENR 12/4.

N. J., Elizabeth—Union County Park Comn., Warinanco Park, W. R. Tracy, engr. and secy., artesian well; adv. ENR 12/4.

Bids Asked December 23

★**†Conn., Waterbury**—Bd. P. Wks., City Hall, Pitch Reservoir, compacted earth dam with concrete spillway in town of Morris, Conn. 6-101. **DPW.** Bureau Eng., City Hall, Waterbury, engrs. Malcom Pirnie, 25 W. 43 St., New York, N. Y., engr.; adv. ENR 12/4. CD 11/21—ENR 11/27.

LOW BIDDERS

†Mo., Rolla—Defense Pub. Wks. Div., FWA, Porter Bldg., Kansas City, Mo., Nov. 28, Sect. 3, exten. water distr. sys., mains, gates, etc., from E. J. Fischer, 4134 Westminster St., St. Louis, Mo. **$73,785.** CD 11/25.

†Wash., Fort Lewis—Con. Q. M., Fort Lewis, Nov. 28, exten. water distr. sys., Inv. 6105-42-32, from L. Coluccio, 512-21 Ave. S., Seattle. **$80,540.**

Wash., Kelso—City, Nov. 25, furnishing materials for new filtration plant, exten. water distr. sys., from H. G. Purcell Co., Colman Bldg., Seattle. **$86,491.** Est. $65,000. CD 11/11.

Wash., Tacoma—City, Nov. 24,, removing 9,910 ft. 54 in. pipe, trenching, backfilling 9,910 ft. 58 in. concrete pipe, from Valley Constr. Co., 8423 48 Ave. S., Seattle. **$72,546.** CD 11/18—ENR 11/27.

CONTRACTS AWARDED

†Calif., Fort Ord—Con. Q.M., 400 ft. well, pump and storage tank, to R. S. Friend, Watsonville. **$16,985.** CD 11/19—ENR 11/27.

Conn., Bridgeport—Bridgeport Hydraulic Co., 835 Main St., WW, constructing brick, concrete, control house and 2 gate houses, Easton, to Harry Maring Jr., Inc., 536 Lindley St. Est. **$15,000.** Clarence M. Blair, Inc., 100 Crown St., New Haven, engrs.

†N. J., Fort Dix—Con. Q.M., pump house, to Artesian Well & Equipment Co., 30 Church St., New York, N. Y. **$22,809.**

Okla., Choteau — Town, WW sys. **WPA. $225,000.** T. P. Clonts, Muskogee, Okla., engr. CD 8/21—ENR 8/21.

Pa., Cambridge Springs—Boro, Marjorie R. Conroy, secy. WW imprvs., enlarging filter beds, purchasing, installing 2 new dry feed machines, and chlorinator at plant, own forces. **$25,000.** CD 10/9—ENR 10/16.

Pa., York—York Water Co., York, c.i. distr. mains, pump. station, service connections, meters, etc., Pleasantville, own forces. **$15,000-$20,000.**

Tex., Freeport — New River Development Co., Freeport, and c/o F. A. Hunter, of Hunter Realty Co., 2808 Sunset Blvd., Houston, water distr. lines, sanitary sewer lines, collecting lines, gas lines, etc., in homes area, here and vicinity, force account and subcontracts. Approx. **$275,000.** CD 11/24—ENR 11/27, under Commercial Bldgs.

Tex., Gilmer—Farmers Electric Generating Co-operative, Gilmer, H. P. McGaughy, pres., drilling, casing, developing deep water well, pump installation, etc., to Layne-Texas Co., 6931 Harrisburg Rd., Houston, approx., **$21,600.** Freese & Nichols, Capps Bldg., Fort Worth, engrs.

Wis., Green Bay—City Water Comn., 7 St. well, to Layne-Northwest Co., 709 N. 11 St., **$18,880**; reconditioning Mason St. and Shawano Ave. wells, to Jos. Egerer, 1012 N. 3 St., **$17,897.** Bids 11/13. F. J. Steeno, city engr.

†T. H., Fort Shafter—Con. Q.M., water sys. in Aliamanu Crater, Hawaiian Ordnance Depot, to Hawaiian Contg. Co., Ltd., 854 Kaahumanu St., P. O. Box 3468, Honolulu. **$109,825.** Bids 11/14. CD 11/11.

Alta., Granum—Dpt. National Defense for Air, Ottawa, Ont., water and sewerage sys., Relief Intermediate Aerodrome, to General Constr. Co. Ltd., Claresholm. **$18,000.**

Man., Brandon—Dpt. National Defense for Air, Ottawa, water and sewerage sys., S.F.T. School 12, to Henry Borger & Son, Ltd., 194 Osborne Ave., Winnipeg. **$30,000.**

Man., Petrel—Dpt. National Defense for Air, Ottawa, water and sewer services, sewage disposal plant, Relief Intermediate Aerodrome, to Henry Borger & Son, Ltd., 194 Osborne Ave., Winnipeg. **$32,000.**

Newfoundland, Tor Bay—Dpt. Transport, Ottawa, Ont., water supply main for airport, to McNamara Constr. Co. Ltd., Industrial St., Toronto, Ont. About **$20,000.**

Newfoundland, Tor Bay—Dominion Govt., Ottawa, Ont., WW for new townsite, near here, to Dominion Constr. Co. Ltd., Redford Bldg., Toronto, Ont. Est. **$55,000.** Dpt. Defense for Naval Affairs, archts., and Dpt. Munitions & Supply, engrs., both Ottawa, Ont.

Ont., Arnprior—Dpt. National Defense for Air, Ottawa, installing water and sewerage sys., Elementary Flying Training School, to H. J. McFarland Constr. Co. Ltd., Elizabeth St., Picton. **$49,000.**

Ont., London—Public Utilities Comn., E. V. Buchanan, genl. mgr., installing 7,500 ft. c.i. 8 in. watermain, day labor. **$22,000.** CD 11/12—ENR 11/20.

Ont., Shelburne—Dpt. National Defense for Air, Ottawa, pump. equip. and water storage tank, R.C.A.F. Station, to Tomlinson Constr. Co., Ltd., Yarmouth, N.S., **$20,000.**

Que., Mount Royal (P. O. Montreal)—Municipality, c/o E. Ravel, clk., watermains in 2 streets, day labor. **$27,000.** W. MacNeil, 1020 Laird Ave., engr. CD 5/8—ENR 5/15.

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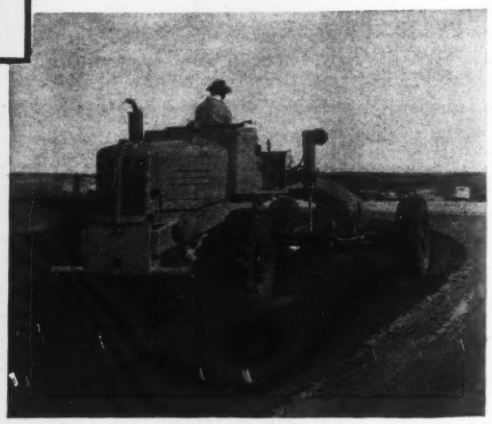

SEWERS—WASTE DISPOSAL

PROPOSED WORK

Calif., Los Angeles — Vitr. clay sanitary sewers, Belle Porte Ave. and 206 St. Sewer Dist. $59,091. L. Aldrich, City Hall, engr.

Calif., Port Hueneme — Oxnard Harbor Dist., Port Hueneme, seeking permit to construct 42 in. steel outfall sewer line to extend 900 ft. into Pacific Ocean to depth 20 ft. below mean lower low water, foot of 4 St.

Idaho, Boise — City Hall, sewage disposal plant. $475,000. DPW funds sought. CD 4/16—ENR 4/24.

Ill., Rantoul—Storm sewerage sys. addn. $25,000.

Ia., Atlantic—G. Alexander, city clk., sewage disposal plant. $30,000.

Ia., Iowa City—Sewage plant imprvs. $93,000. W. J. Buchele, city engr.

Mich., Lansing—Sewage treatment plant, $75,000. Shoecraft, Drury & McNamee, Ann Arbor, Mich., engr.

Minn., Baudette—R. J. Flynn, town clk., sewage disposal plant, interceptor sewers. Over $25,000. J. C. Taylor, 902 Minnesota St., Hibbing, engr.

Minn., Breckenridge—Mrs. Ruth Hamilton, city clk., $30,000 bond election Dec. 15, sewerage sys.

Minn., Greenwald — M. C. Mader, village clk., sewage treatment plant, sanitary sewerage sys. **WPA.** Est. over **$50,000.** E. G. Briggs, 1955 University Ave., St. Paul, engr. CD 8/28—ENR 9/4.

★**Nev., Las Vegas**—Sanitary sewerage sys. $500,000. Currie Eng. Co., Andreson Bldg., San Bernardino, Calif., engrs.

N. Y., Salamanca—T. H. Wilson, mayor, storm water sewerage sys. Over $40,000. D. H. Andrews, city engr.

Okla., Salina—Sanitary sewerage sys., sewage disposal plant. $75,000. Applied for DPW gr. H. T. Lawrence, 3244 W. 14 St., Oklahoma City, engr.

Tex., Abernathy—Voted $45,000 bonds, sanitary sewerage sys. H. N. Roberts, 2415 20 St., Lubbock, engr.

Tex., Alvin—L. Merchant, mayor, sanitary sewers. $25,000. Applied for DPW funds. Hedrick & Lindsley, 818 Southern Standard Bldg., Houston, engrs. CD 9/26—ENR 10/2.

Tex., Bloomington — Voted $35,000 bonds, sanitary sewerage sys.

Tex., Corpus Christi—City voted $100,000 bonds, incinerator. Will apply for federal funds. G. Blackburn, city engr. CD 11/7—ENR 11/13.

†Tex., Midland—U. S. Eng., Federal Bldg., Galveston, assisted draft incinerator plant, etc.

★**†Tex., San Antonio**—City, c/o C. K. Quin, mayor, bids soon, imprv., expanding sewage disposal plant. $750,000. DPW funds earmarked. J. W. Beretta & Co., Inc., c/o N.B.C.B., F. Drought and H. R. F. Helland, c/o Frost Bldg., W. E. Simpson Co., c/o Milan Bldg., Mathews & Kenan, c/o Smith-Young Tower, all San Antonio, engrs. CD 10/17—ENR 10/23.

Tex., Victoria—Victoria County Water Control & Imprvt. Dist. voted $25,000 bonds, sanitary sewers. E. F. Miles, Victoria, engr. CD 9/3—ENR 9/11.

Utah, Salt Lake City—W. D. Beers, city engr., City County Bldg., 18 to 36-in. sanitary sewerage sys. $422,000. Seeking PWA gr.

★**Va., Portsmouth**—Voted $1,700,000 bonds, 2 sewage disposal plants. C. F. Harper, city mgr.

BIDS ASKED

Bids Asked December 12

Wis., Milwaukee — Milwaukee Sewerage Comn., Jones Island, 1 story, 118x120 ft., steel, brick, glass block milarsenite bldg., 22 ft. high, for sewage disposal plant. J. L. Ferebee, c/o owner, ch. engr.

Bids Asked December 15

†Tex., Velasco—City, c/o E. F. Roeller, mayor, water and sewerage sys., Docket Tex. 41-189. $130,000. **DPW.** Garrett Eng. Co., 3504 Audubon St., Houston, engrs. CD 11/11—ENR 11/13.

Wash., Kirkland—Sewer lines. $150,000. H. H. Sisler, 2821 29 Ave. W., Seattle, engr.

Bids Asked

N. J., Kearny (br. Arlington) — Western Electric Co., 100 Central Ave., sewer mains at plant. Over $25,000.

LOW BIDDERS

†Calif., Long Beach—U. S. Eng., 751 S. Figueroa St., Los Angeles, Nov. 24, sewer, water and gas sys., Long Beach Ferrying Command, from Marko Matick, 1269 Eagle Vista Dr., Los Angeles, **$32,148.** CD 11/10—ENR 11/13.

★**Conn., Stamford**—J. F. Connolly, Comr. Finance, Municipal Bldg., Nov. 25, sewerage sys. exten.; etc., outfall sewers, from P. Bacco, 179 Bedford St., **$177,334*****general contract sewage disposal plant, from Thompson Starrett Co., Inc., 444 Madison Ave., New York, N. Y., **$855,226*****Garbage incinerator, from Caulway, Inc., 1841 Bway., New York, N. Y., **$105,500.** Est. $1,250,000. CD 10/15—ENR 10/23.

†Mo., Rolla—Defense Pub. Wks. Div., FWA, Porter Bldg., Kansas City, Mo., Nov. 28, Sect. 2, sanitary sewerage sys., outfall sewer, from Nolan Constr. Co., 14101 Plymouth St., Detroit, Mich. **$158,907.** CD 11/25.

†Mo., Waynesville—Defense Pub. Wks. Div., FWA, Porter Bldg., Kansas City, Mo., Nov. 28, sanitary sewerage sys., outfall sewer to treatment plant, from E. J. Fischer, 4134 Westminster St., St. Louis. **$73,895.** CD 11/25.

N. J., Livingston—Town, Town Hall, Nov. 17, 9 mi. sewers, grading, force main, pump. station, near Livingston Center, Sects. 1 and 4, from Cestone & Postiggi, 473 15 Ave., Newark, **$46,661*****Sect. 2, Guy Villa & Sons., Inc., Raritan Rd., Clark, **$37,482*****Sect. 3, from Cestone Bros., 2 Cliff St., Verona, **$46,205.** CD 11/11—ENR 11/13.

†N. Y., Sidney—Pub. Bldgs. Admin., 7 and D Sts. S.W., Wash., D. C., Nov. 26, sewage treatment plant for defense housing, from T. M. Flanaghan, Amer. Casualty Bldg., Reading, Pa. **$34,881.** CD 11/12—ENR 11/20.

†Tex., Freeport—W. Allen, mayor, Freeport, Nov. 19, sanitary sewer imprvs., exten. sewerage sys., Tex. 41-262. from Tellepsen Constr. Co., 3900 Clay St., Houston. **$83,033. DPW.** Est. $83,000. CD 11/5—ENR 10/2.

†Va., Norfolk—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Nov. 12, incinerator, Naval Operating Base No. 10619, from Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa., **$67,500.** CD 10/28—ENR 10/30.

CONTRACTS AWARDED

O., Medina—Revamping sanitary sewerage sys., reconditioning sewage disposal plant, to M. Fatol Co., 3553 E. 103 St., Cleveland. **$65,000.** Awarded 11/22. CD 11/13—ENR 11/20.

Okla., Choteau—Sanitary sewerage sys., sewage disposal plant, **WPA.** **$175,000.** T. P. Clonts, Muskogee, engr.

Pa., York — Sanitary and storm sewers, backfilling, manholes, inlets, replacing pavements, etc., blanket project. **WPA.** **$89,136.** C. F. W. Wallow, city tngr.

†S. C., North Charleston—North Charleston Pub. Serv. Dist. Comn., North Charleston, exten. sewerage sys., Docket S.C. 38-119, to Boyle Constr. Co., Sumter. **$73,210. DPW.** Bids 11/26. CD 11/3—ENR 11/6.

Tex., Austin — G. Morgan, mgr., sanitary sewer collecting line extens. **WPA.** **$242,166.**

Tex., Lockhart—Storm sewers, drainage ditches, water and sanitary mains, curbs, gutters, etc., **WPA.** **$136,835.**

†Tex., Randolph Field—Con. Q.M., addnl. expansion, rehabilitation utilities, sanitary sewers, water lines, electric distributing and heating sys., etc., military area. **WPA.** **$247,352.**

BRIDGES GRADE CROSSINGS

PROPOSED WORK

Ill., Dupo—State Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, overcrossing for FA Rt. 4, over Missouri Pacific R.R. tracks, near here. M. J. Fleming, Centennial Bldg., Springfield, asst. ch. hy. engr.

Kan., Kansas City—City, bids soon repairing 18 St. viaduct, for Union Pacific R. R. Co., B. H. Prater, ch. engr., 1416 Dodge St., Omaha, Neb., Chicago, Rock Island & Pacific Ry. Co., W. H. Willis, asst. ch. oper. officer, La Salle St. Station, Chicago, Ill., and Kansas City Pub. Serv. Co., 728 Dela St., Kansas City, Mo. $30,000. T. Schlup, city engr. CD 4/16—ENR 4/24.

O., Youngstown—Mahoning Co., new Spring Common Bridge, present site. $481,000. R. J. Schomer, Youngstown, engr.

Tex., Granbury—State Hy. Comn., B. P. Gentry, chn., Austin, bids soon Gulf, Colorado & Santa Fe R.R. underpass, approaches, 0.557 mi. U. S. Hy. 377, FAGH-92-(7), Hood Co.

★**†Canal Zone, Ganboa**—The Panama Canal, 1439 K St. N.W., Wash., D. C., rejected bids Oct. 10, altering Ganboa Bridge. $500,000. Will not readvertise. CD 10/2—ENR 10/9.

Ont., New Hamburg—Wilmot Twp., New Hamburg, steel bridge over Nith River. $40,000.

Ont., Whitby — Canadian National R.R., Union Station, Toronto, B. Wheelwright, ch. engr., reconstructing bridge. $40,000.

BIDS ASKED

Maryland—State Road Comn., Baltimore, reconstructing 620 ft. existing bridges, St.

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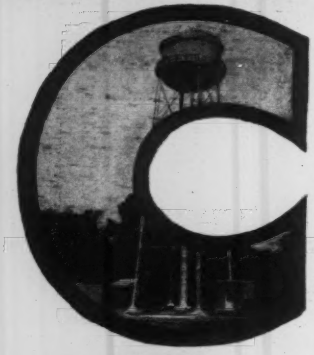

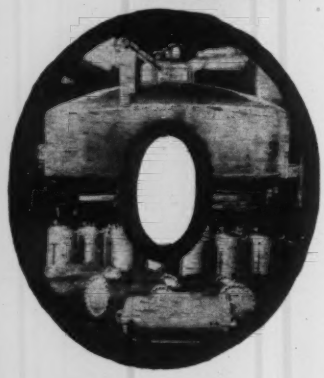

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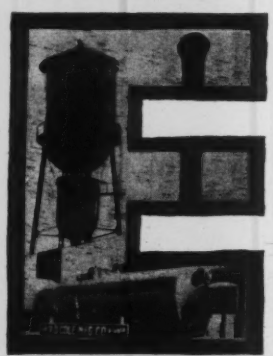

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BRIDGES, etc. (Bids Asked, Cont'd.)

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Bids Asked December 11

†**D. C., Wash.**—Pub. Roads Admin., Winder Bldg., 17 and F Sts. N.W., Bridge 3, War Dpt. Bldg., road network.

Bids Asked December 12

Kansas—State Hy. Dpt., Emporia, Bridge 7.0, two 14x18x32 ft. rein.-con. rigid frame, FA 419 G. Bridge 2.6, 40, 49, 49, 40 ft. continuous steel bridge spans, FA 419 D, Bridge 10.1, 100 ft. 30x38x30 ft. con. slab, FA 419 G, all foregoing Lyon Co. W. S. McDaniel, Topeka, asst. engr.

Quebec—I. E. Vallee, deputy minister, Province of Quebec, Parliament Bldg., Quebec City, bridge over North River, St. Jerome Hy., Shawbridge, Terrebonne Co. $45,000. O. S. Desjardins, Dpt. P. Wks., Quebec City, engr.

Bids Asked December 16

Indiana—State Hy. Comn., S. C. Hadden, chn., Indianapolis, 1 span, 35 ft., rein.-con. arch bridge over West River, 1 span, 50 ft. rein.-con. arch bridge over Martindale Creek, State Rd. 36, Bridge Contr. 2231, Randolph Co.; 4 bridges, 3 rein.-con. girder exten., 1 span each, State Rd. 62, over Prong, Carter Ditches and Cypress Creek, Bridge Contr. 2237, Warrick Co.; 1 span, 50 ft. long, steel beam bridge over Pipe Creek, Rd. 13, Bridge Contr. 2263, Grant Co.; 30 ft. rein.-con. rigid frame bridge over Turkey Creek, Rd. 13, Bridge Contr. 2264, Kosciusko Co.; 3 span, 65 ft. continuous rein.-con. slab bridge over Hutton Ditch, State Rd. 30, 24 ft. rein.-con. slab (abutment exten.) over Slocum Ditch, Rd. 30, Bridge Contr. 2265, Porter and La Porte Counties; 80 ft. rein.-con. arch bridge over Brandywine Creek, State Rd. 40, Bridge Contr. 2266; 28 ft. rein.-con. girder abutment exten. over Little Brandywine Creek, 37 ft. rein.-con. girder abutment exten. over Nameless Creek, both State Rd. 40, Bridge Contr. 2267, both Hancock Co.; 60 ft. rein.-con. arch over Bruch Creek, State Rd. 52, Bridge Contr. 2268, four 60 ft. rein.-con. arch span over Sugar Creek, State Rd. 52, Contr. 2269, both Boone Co.; three 65 ft. rein.-con. arches over Prairie Creek, State Rd. 52, Contr. 2270, Boone Co.; 60 ft. rein.-con. arch exten., grading, paving State Rd. 135, over Bear Creek, Contr. 2271; 75 ft. rein.-con. arch span bridge over Broch Creek, State Rd. 135, Contr. 2272, both Washington Co.; portal changes to through steel truss bridges (30 in all), Clay, Crawford, Davies, Dubois, Gibson, Greene, Knox, Lawrence, Martin, Orange, Perry, Pike, Posey, Spencer, Vanderburgh and Warrick Counties, Contr. 2273. M. R. Keefe, c/o State Hy. Comn., ch. engr.

Maryland and **Virginia**—State Roads Comn., Baltimore, Md., L. H. Steuart, secy., steel bridge superstructure, concrete deck, etc. for 2,230 ft. bridge over Potomac River between Sandy Hook, Washington Co., Md. and Loudoun Co., Va.; adv. ENR 12/4.

★**Wash., Seattle**—State Hy. Dpt., Olympia, 0.8 mi. viaduct, concrete deck, creosoted timber or concrete approaches, Spokane St. $1,000,000. B. Bantz, Olympia, state hy. dir. CD 7/28—ENR 7/31.

Bids Asked December 17

†**California**—Bureau Reclamation, Customhouse Denver, Colo., furnishing, del. structural steel for highway bridge, Sta. 26 plus 12.36, Friant-Kern Canal, Friant Div., Central Valley Project, Spec. 1596-D.

Bids Asked December 19

New Jersey—E. D. Sterner, comr. State Hy. Dpt., Trenton, overpass, Route 42, Folsom Boro, Route 54, Sect. 1, Atlantic Co.; adv. ENR 12/4.

LOW BIDDERS

Colorado—State Hy. Dpt., Denver, Nov. 26, railroad underpass, bridge, 0.851 mi. surfaced approaches, Mesa Co., from Colorado Bridge & Constr. Co., 2354 Kearny St., Denver. **$104,969.** Est. $96,303. CD 11/19.

†**D. C., Wash.**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., concrete pedestrian tunnel, Naval Medical Center, Spec. 10679, from Albert & Harrison, Inc., 271 W. 125 St., New York, N. Y., **$47,450.** CD 11/11—ENR 11/13.

Florida—State Road Dpt., Tallahassee, T. A. Johnson, chn., Nov. 25, bridge, Calhoun Co., from Boozer & Bristol, Tallahassee, **$31,796***** bridge, Liberty Co., from Peterson & Earnhart, Tallahassee, **$37,466*****bridge Hamilton Co., from Hinely Constr. Co., Live Oak. **$38,283.** CD 11/18.

Low Bidders

North Carolina—State Hy. & P. Wks., Comn., Raleigh, Nov. 27, 3.13 mi. structures, Stokes Co., from L. Riddle & Co., Asheville, **$45,568;** 11.68 mi. structures, Cabarrus and Stanly Counties, from Hobbs-Peabody Constr. Co., 317 W. Worthington Ave., Charlotte. **$74,464.** CD 11/18.

South Carolina—State Hy. Dpt., Columbia, Nov. 25, 260 ft. rein.-con. bridge over Warrior Creek and 410 ft. rein.-con. structural steel bridge over Enoree River, Laurens and Spartanburg Counties, from C. Y. Thomason, Greenwood, **$84,596*****300 ft. rein.-con., structural steel bridge over Rantowles Creek and 270 ft. rein.-con. bridge over Wallace Creek, Charleston Co., from J. W. Barnwell, Jr., Columbia, **$54,971** *** Contr. 4-A, structural steel superstructures for main spans bridge

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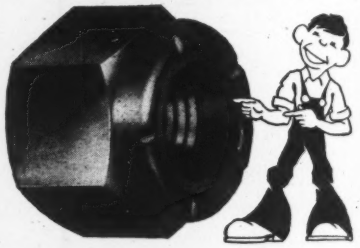

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BRIDGES, etc. (Low Bidders, Cont'd.)

over Santee River, Clarendon and Orangeburg Counties, and Contr. 4-B, rein.-con. deck for superstructures same bridge, from Vincennes Steel Corp., Vincennes, Ind., **$219,325.** CD 11/19.

Texas—D. C. Greer, engr. State Hy. Dpt., Austin, Nov. 25, drainage structures, channel excav. and detour 10.207 mi. U. S. Hy. 87, Calhoun Co., from Austin Bridge Co., 1813 Clarence St., Dallas, **$60,664.** Est. $57,217. CD 11/18 under Roads.

Virginia — Dpt. Hys., Richmond, Nov. 25, bridge, Nansemond Co., from Highway Contractors, Inc., Norfolk, **$63,772**; bridge, approaches, Bedford and Franklin Counties, from Pendleton Constr. Corp., Wytheville, **$248,156.** CD 11/12—ENR 11/20.

†Virginia—Pub. Roads, 515 14 St. N.W., Wash., D. C., Bridge 1 to War Dpt. Bldg., from Cayuga Constr. Corp., 30 Vesey St., New York, N. Y. **$289,958.**

STREETS AND ROADS

BIDS ASKED

Bids Asked December 9

Maryland—State Roads Comn., Baltimore, grading, drainage, bituminous stabilized base course 1.5 mi. Greensboro-Burrsville Rd., Contr. Co-140-1-250, Caroline Co.; channelization along U. S. Route 40, incl. connecting road, road connections, concrete surfacing, curbing, etc., Contr. H-259-1-411 and CE-234-1-411, Harford and Cecil Counties.

West Virginia—State Road Comn., D. McClaugherty, secy., Charleston, grading, draining, concrete paving 1.397 mi. State Route 2 (Weirton), FAP FA 175-H(1), Hancock Co.; grading, draining, asphaltic concrete on macadam surfacing 5.174 mi. State Route 47, Kanawha Station-Parkersburg Rd., S.P. 3538, Wood Co.

Bids Asked December 11

N. Y., Brooklyn—President Brooklyn Boro, Boro Hall, permanent asphalt paving Avenue Y, E. 21, E. 48, E. 91 and 57 Sts.

Bids Asked December 12

Arizona—State Hy. Comn., W. R. Hutchins, engr., Phoenix, grading, drainage, aggregate base course, road mixed bituminous surfacing 4 mi. Superior-Miami Hy., SN-FA (4) Pinal Co. Over $50,000.

Kansas—State Hy. Dpt., Emporia, resurfacing material 8.032 mi. K1562 AB, Lyon Co.; 3.972 mi. K1555 and 4.73 mi. K1556, Jackson Co.; 5.978 mi. K1557, Marshall Co.; 6 mi. K1558, Nemaha Co.; 2.045 mi. K1559 and 8.039 mi. K1560, Pottawatomie Co.; grading 5.28 mi. FA 419 G and 5.026 mi. FA 419 D, Lyon Co.; surfacing for detour, 8.99 mi. FA 419 D, Lyon Co. W. S. McDaniel, Topeka, asst. engr.

Pennsylvania—State Hy. Dpt., I. L. Hughes, secy., Harrisburg, bituminous on native stone type A or crushed aggregate surfacing, exten. structure, 13,179 ft. Legislative Route 99, Sect. 1-A, Traffic Route 120, Ridgway Boro, Ridgway Twp., Elk Co.; rein.-con. paving, exten. 2 structures, rein.-con. paving, 16,554 ft. Legislative Route 4, Sect. 15, Traffic Route 11, Plymouth Boro, Luzerne Co.; rein.-con. paving, rein.-con. box, bituminous on crushed aggregate surfacing, plate girder overpass bridge, 13,220 ft. Legislative Route 151, Sect. 3, Traffic Route 611, Montgomery Co.; rein.-con. paving, grading, drainage, through truss bridge, bituminous on native stone type A or crushed aggregate surfacing 4,993 ft. Legislative Routes 22, Sect. 11, and 58051, Traffic Route 15, Tioga Boro, Tioga Twp., Tioga Co. T. C. Frame, c/o owner, ch. engr.

Bids Asked December 15

Ill., Oglesby — Concrete paving, grading, sidewalks, comb. curbing, storm sewers, etc., 0.1012 mi. Sect. 4-CS; 3 span, rein.-con. slab bridge over Illinois Central R.R., Walnut St., Sect 4V-CS. G. H. Baker, Centennial Bldg., Springfield, state engr. co. roads and city streets CD 10/9—ENR 10/16.

Bids Asked December 16

★**Virginia**—State Hy. Dpt., Richmond, waterbound macadam, surfacing 3 mi. Route 23, Proj. S-428-CR1, AR1, BR1, Scott Co.; concrete curbing, guttering 0.2 mi. Route T1124 and 1112, Proj. S-1040-M3,, 5 (C and G), Elizabeth City; grading, drainage, bridges, 3.4 mi. Route Alt. 1, Proj. S-1235-C1, B3, Spotsylvania Co.; concrete curbing, guttering, 0.86 mi. Locust, Greenbrier, Hampton Roads and Cherokee Aves. Routes 1504, 609, 1525, 1529, 1212, Proj. S-1352, M1, 2, 3, 4 (C and G), S-1048-M4 (C and G), Elizabeth City, etc. Approx. $500,000.

Bids Asked December 17

Kansas—State Hy. Dpt., Abilene, stabilized and double asphalt surfacing 3.953 mi. FA 499 H, Washington Co.; 7.100 mi. FA 377 C, Dickinson Co.; resurfacing material 11.083 mi. K2515, Morris Co. W. S. McDaniel, Topeka, asst. engr.

Bids Asked December 17

Kansas—State Hy. Dpt., Alma, resurfacing material 1 mi. K1561, Wabaunsee Co. W. S. McDaniel, Topeka, asst. engr.

Louisiana—State Dpt. Hys., Baton Rouge, bituminous surfacing 6.594 mi. Raceland-Des Allemands Hy., S.P. 5-07-13, Route 2, Lafourche Parish.

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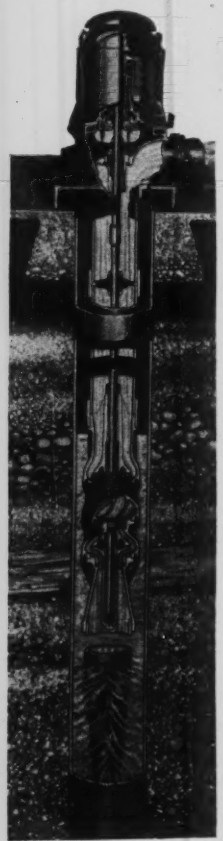

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STREETS, etc. (Bids Asked, Cont'd.)

Bids Asked December 18

New York—A. W. Brandt, supt. P. Wks., State Dpt. P. Wks., Div. Hys., Albany, imprv. hys., bridges Broome, Cayuga, Erie, Steuben, and Montgomery Counties.; adv. ENR 12/4.

Bids Asked December 19

Kentucky—Dpt. Hys., Frankfort, grading, draining, low type surfacing 0.17 mi. Grayson-Louisa Rd., SP 22-48, Carter Co.; 6.017 mi. Worthville-Ball's Landing-Gratz Rd., SP 94-233, SP 94-153 and SP 94-273, Owen Co.

Bids Asked

Minnesota—State Hy. Dpt., St. Paul, rejected bids Nov. 14, imprv. 1.2 mi. SP 6903-01 (Trunk Hy. 1-160), SP 6904-03 (TH -35) and SP 6913-01 (TH 35-35); 4.9 mi. SP 6931-02 (TH -163). CD 11/25—ENR 11/27, under LB.

LOW BIDDERS

Ala., Mobile—Bituminous paving Bankhead vehicular tunnel and altering ventilation bldg., from Hancock Co., 310 St. Michael St., **$37,476.**

Arizona—State Hy. Comn., Phoenix, Nov. 21, imprv. 2.9 mi. Globe-Young Hy., from D. A. Flickinger, Globe. **$52,991.** CD 11/13—ENR 11/20.

California—State Hy. Dpt., 808 State Bldg., Los Angeles, Nov. 21, imprv. 0.6 mi. Los Angeles Co., from R. L. Oakley, 445 Bellefontaine St., Pasadena, **$30,439;** 3.2 mi. San Bernardino Co., from Oswald Bros., 366 E. 58 St., Los Angeles. **$123,560.** CD 11/3—ENR 11/6.

California—At office C. H. Purcell, engr. State Hy. Dpt., Sacramento, Nov. 26, imprv. 4.2 mi. Solano Co., from N. M. Ball Sons, P. O. Box 404, Berkeley, **$359,902.** CD 11/12.

Colorado—State Hy. Dpt., Denver, Nov. 18, imprv. hy., bridge 0.481 mi. Eagle Co., from H. Shore, Box 189 Littleton, **$35,962;** 7.082 mi. S.H. 83, Douglas Co., from De Remer & Atchison, Littleton, **$341,881.** CD 11/11.

Florida—State Hy. Dpt., T. A. Johnson, chn., Tallahassee, widening, resurfacing 5.5 mi. Rd. 5, Citrus Co., from W. L. Cobb Constr. Co., 1 Ave. and 22 St., Tampa. **$73,345.**

Louisiana—State Dpt. Hys., Baton Rouge, Nov. 26, imprv. 7.679 mi. S. P. 913-03-11, St. Tammany Parish, from Barber Bros. Contg. Co., Reymond Bldg., Baton Rouge, **$91,000.** CD 11/11—ENR 11/13.

Maryland—State Roads Comn., Baltimore, Nov. 25, imprv. 0.44 mi. Contr. A-254-C11, Allegheny Co., from G. C. Sensbaugh, Cumberland, **$51,146;** 0.96 mi. Contr. P 315-3-511, Prince George Co., from R. H. Houghton, Inc., Odenton, **$78,858.** CD 11/19.

N. Y., Kew Gardens—President Queens Boro, Queens Boro Hall, 12-55 Queens Blvd., Nov. 26, imprv. Francis Lewis Blvd., from B. Turecamo Contr. Co., E. 11 St. and Voorhies Ave., Brooklyn, **$350,416.** CD 11/17—ENR 11/20.

North Carolina—State Hy. and P. Wks. Comn., Raleigh, imprv. 1.38 mi. U. S. 74, and underpass under Seaboard Air Line Ry., approaches, Union Co., and 0.67 mi. U. S. 70 + 64, underpass under Southern Ry., approaches, Burke Co., from R. H. Small, 900 E. Blvd., Charlotte, **$102,931** and **$100,390** respectively ***imprv. 3.56 mi. Chowan and Perquimans Counties from J. S. Hill Constr. Co., Washington, **$65,104*****6.78 mi. Pitt Co., from E. W. Grannis, Fayetteville, **$73,112*****2.83 mi. Wake Co., from B. H. Martin, Easley, S. C., **$125,827*****0.61 mi. Hoke and Cumberland Counties, from R. E. Fuller, 1800 Fairview Rd., Raleigh, **$43,177*****11.68 mi.,Cabarrus and Stanly Counties, from W. E. Graham, Cleveland, **$136,711*****3.13 mi., Stokes Co., from W. W. Tuck & Son, Virgilina, Va., **$40,537.** CD 11/18.

Ohio—State Hy. Dpt., Columbus, Nov. 18, imprv. 1.237 mi. Medina Co., from Herring & Mayback, 2936 Litchfield Rd., Cleveland, **$105,323.** Est. $105,500. CD 11/6—ENR 11/13.

Oregon—State Hy. Comn., Pub. Serv. Bldg., Portland, Nov. 17, imprv. 10.42 mi. Coos Co., from Coos Bay Dredging Co., Marshfield, **49,247;** 1.87 mi. Lane Co., from Strong & Macdonald, Inc., 1011 E. F St., Tacoma. **$205,516.** CD 11/12.

South Carolina—State Hy. Dpt., Columbia, Nov. 25, imprv. 10.71 mi. Allendale Co., and 8.946 mi. Orangeburg Co., from W. A. Fuller & Sons, Barnwell, **$90,792** and **$49,302** respectively***1,299 mi. Charleston Co., from Hubbard Constr. Co., Marion, **$33,220*****12.086 mi. Chesterfield and Lancaster Counties, from Boyle Constr. Co., Sumter, **$187,399*****0.677 mi. Spartanburg Co. from Pennell & Harley, Inc., Spartanburg, **$42,572.** CD 11/19.

★**Texas**—D. C. Greer, engr. State Hy. Dpt., Austin, Nov. 25, imprv. 2.419 mi. Tom Green Co., from H. L. Campbell, 1205 6 Ave., Fort Worth, **$86,265** est. $122,382*** 6.003 mi. Mitchell Co., from Thomas & Ratliff, Roger, **$163,821** est. $159,800***9.165 mi. Dawson Co., from Public Constr. Co., Denton, **$56,985** est. $65,098***8.427 mi. Medina Co., from Colglazier & Hoff, 326 Seguin Rd., San Antonio, **$25,874** est. $25,273***14.571 mi. Dallam Co., from Bill & Braden, Herring Hotel Bldg., Amarillo, **$156,963** est. $156,864***15.749 mi. Swisher and Briscoe Counties, from J. E.

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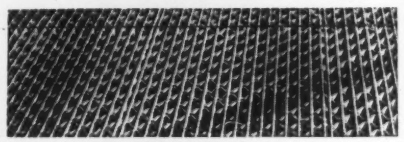

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STREETS, etc. (Low Bidders, Cont'd.)

and H. Barnhill, Turkey, **$120,753** est. $137,523***18.333 mi. Pecos Co., from Cage Bros. & F. M. Reeves, Bishop, **$137,179** est. $150,411. CD 11/18.

★**Texas**—D. C. Greer, engr. State Hy. Dpt., Austin, Nov. 26, imprv. 16.486 mi. Hill and Navarro Counties, from Geo. Kies, Inc., 71000 Pease Rd., Austin, **$375,207**, est. $413,035*** 4.259 mi. McCullough Co., from Cage Bros. and F. M. Reeves, Bishop, **$101,526**, est. $102,629***15.089 mi. Fort Bend Co., from Austin Bridge Co., 1813 Clarence St., Dallas, **$257,487**, est. $261,476***0.448 mi. Grayson Co., from Wallace & Bowden, 5513½ E. Grand Ave., Dallas, **$87,631**, est. $89,491***4.792 mi. Gonzales Co., from Cage Bros. and L. A. Turner, Bishop, **$39,632**, est. $49,546***7.07 mi. Colorado Co., from R. B. Butler, Bryan, **$57,035**, est. $68,841***17.644 mi. Wharton Co., from Cage Bros. and H. E. Williams, Bishop, **$195,090**, est. $166,439. CD 11/18.

★**Virginia**—Dpt. Hys., Richmond, Nov. 25, imprv. 1.5 mi. Accomack Co., from Phillips Bros., Salisbury, Md., **$63,703*****1.2 mi. Charlotte Co., from G. P. Clay, 900 Blanton Ave., Richmond, **$62,259*****4.1 mi. Franklin Co., from Ralph E. Mills Co., Inc., Roanoke, **$118,776*****2.98 mi. Smyth Co., from John A. Archer & Son, Wytheville, **$102,693*****1.9 mi. Loudoun Co., and 5.8 mi. Shenandoah and Frederick Counties, from W. N. Jackson, Roanoke, **$84,641** and **$124,447** respectively. CD 11/12—ENR 11/20.

CONTRACTS AWARDED

Ariz., Tucson—Paving 9,850 ft. runways, at Tucson municipal airport, to Pearson & Dickerson, Prescott. **$190,098.** CAA.

Ark., Monticello—L. W. Bell, judge Drew Co., imprv. roads. **WPA. $174,021.**

Ark., Morrilton—G. Fullerton, judge Conway Co., imprv. roads, **WPA. $323,692.**

Florida — State Road Dpt., Tallahassee, imprv. 8.674 mi. Palm Beach Co., to Cleary Bros. Constr. Co., Georgia Ave., West Palm Beach. **$255,993.** Bids 10/23. CD 10/16.

Ia., Cedar Rapids—Linn Co., Cedar Rapids, surfacing, resurfacing roads, 7 projects, to C. B. Dewees, Marion, **$25,249.** CD 11/14—ENR 11/20.

Ky., Paducah—McCrocken Co. Judge, imprv. roads, **WPA. $292,916.**

†**La., Camp Polk**—Con. Q.M., Camp Polk, additional access roads, to W. R. Aldrich & Co., Louisiana Natl. Bank Bldg., Baton Rouge. **$199,394.**

Minn., Spooner—F. A. Johnson, town clk., imprvv. streets, drains, water facilities, **WPA. $55,000.**

Neb., Lincoln — Imprv. streets, **WPA. $402,169.** D. L. Erickson, city engr.

N. J., Kearny—Grading, bituminous macadam pavements, concrete sidewalks, bluestone curbs, rein.-con. pavements, catch basins, **WPA. $128,910.** C. Malstrom, Orange and N. 6 Sts., Newark, N. J., WPA engr.

N. J., Kearny (br. Arlington) — Western Electric Co., 100 Central Ave., grading, concrete roads at plant, to Franklin Constr. Co., 20 Washington Pl., Newark. **$50,000.** CD 10/15—ENR 10/23.

New Mexico—B. G. Dwyre, engr. State Hy. Dpt., Santa Fe, imprv. 4.791 mi. SNFHP 60A(2), 3.422 mi. FAP 72 (2); and 4.645 mi. FAP 60 B(7), all in San Miguel Co., to Martin & Cowart, Fort Sumner, and W. L. Denison, Albuquerque, **$363,540.** Bids 11/28, awarded 11/28. CD 11/18.

★**Ohio**—State Hy. Dpt., Columbus, imprv. 2.332 mi. Adams Co., to H. Candel, P. O. Box 71, Wellston, **$87,546**, est. $88,300***0.433 mi. Columbiana Co., to G. B. and C. H. Patterson, 1204 Main St., Wellsville, **$38,664**, est. $38,940***1.701 mi. Franklin Co., to R. J. Dienst, 297 S. High St., Columbus, **$170,000**, est. $191,500***0.974 mi. Licking Co., to Baker & Hickey Co., 1250 Livingston Ave., Columbus, **$78,015**, est. $90,100***3.091 mi. Mahoning Co., to The Kelley & Meyer Co., 522 Dollar Bank Bldg., Youngstown, **$71,844**, est. $73,200*** 2.116 mi. Preble Co., to Crist & Beatty, Rentschler Bldg., Hamilton, **$92,638**, est. $93,900. Grand total $538,707. State Hy. Dpt., Columbus, received no bids Nov. 18, imprv. 0.198 mi. Ashtabula Co., $35,500; 4.93 mi. Adams Co., $18,850; 4.733 mi. Noble Co., $124,500; 1.971 mi. Jefferson Co., $45,200. CD 11/6—ENR 11/13.

Oregon—State Hy. Comn., Pub. Serv. Bldg., Portland, 0.24 mi. Multnomah Co., to Edlefsen-Waygandt Co., 9233 N. Calvert St., Portland, **$181,872;** 0.57 mi. rock toe embankment Multnomah Co., to Colonial Constr. Co., 326 1 St., Spokane, Wash. **$87,340.** Bids 11/17. CD 11/12.

Oregon—Sate Hy. Comn., Pub. Serv. Bldg., Portland, imprv. 1.44 mi. Sylvan-West Slope Sect. hy. Tualatin Valley Hy., Washington Co., to P. W. Yett, 6500 NE Ainsworth Blvd., Portland, **$100,665*****2.97 mi. Umatilla Co., to R. O. Dail & Warren Bros., 8919 S.E., Foster Rd., Portland, **$26,289*****2.22 mi. Marion Co., to C. J. Montag & Sons, Couch Bldg., Portland, **$148,029.** Grand total $274,983. Bids 11/18.

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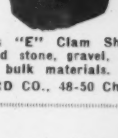

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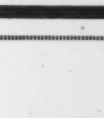

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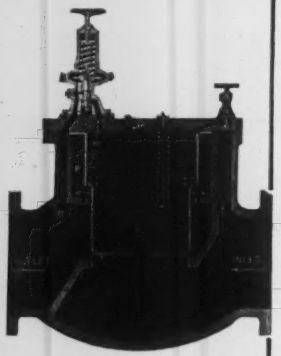

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STREETS, ETC. (Contracts Awarded, Cont'd.)

Pa., Pittsburgh—Bd. Comrs. Allegheny Co., R. G. Woodside, controller, Court House, repaving Brackenridge and Natrona Rd., Harrison Twp., removing street railway tracks, repaving, to Sanctis Constr. Co., 507 Marlow St., **$24,720.** Bids 11/12. CD 11/5.

Tenn., Elizabethton—J. N. Julian, judge Carter Co., imprv. roads, **WPA. $177,048.** N. T. Simerly, Elizabethton, engr.

Tex., Giddings—Lee Co., c/o Judge and State imprv. 4 mi. road. **WPA. $73,328.**

Utah—Utah State Rd. Comn., Salt Lake City, imprv. 5.018 mi. Juab Co., to Atherly Bros. Co., Eureka, **$46,965.** Est. $50,000. Bids 11/18. CD 11/10.

Utah—State Rd. Comn., Salt Lake City, imprv. 4.413 mi., Davis Co., to C. E. Nelson, Logan. **$42,643.** Est. $51,104. Bids 11/12. CD 11/5.

N. S., Yarmouth—Dpt. National Defense for Air, Ottawa, Ont., roads, etc., sewer and water sys., Operational Training School, to Tomlinson Constr. Co. Ltd., Yarmouth. **$136,000.**

Ont., Hamilton—Concrete and asphalt resurfacing Barton St., day labor. **$88,000.** W. L. McFaul, City Hall, engr.

EARTHWORK WATERWAYS

PROPOSED WORK

La., Houma—Timber pile, sheet pile bulkheads, 1 along each bank, Bayou Terrebonne, central to point 185 ft. downstream from St. Louis Cypress Company Canal, mile 37.6 above mouth of waterway, near here, concrete headwall, installing 24 in. storm sewer. Intracoastal Waterway, Mississippi-Atchafalaya River Sect., west bank, at foot of Point St., 63.8 mi. west of Harvey Lock, both Terrebonne Parish.

Nebraska—Beaver-Sappa Soil Conservation Dist., and Furnas Co., Beaver City, 25 dams to store flood waters. $56,000. Applied to WPA. CD 11/5—ENR 11/13.

†**New Jersey**—U. S. Eng., 17 Battery Pl., New York, N. Y., dredging, imprv. Shark River on Atlantic Ocean. $118,000.

N. J., Hoboken—Tietjen & Lang Drydock Co., 1 Bway., New York, N. Y., dredging 90,000 cu. yd. material from Hudson River. Frederic R. Harris, Inc., 27 William St., New York, N. Y., engrs.

N. J., Manasquan—U. S. Eng., 17 Battery Pl., New York, N. Y., dredging Manasquan River. $143,000.

★†**North Carolina**—Tennessee Valley Auth., Knoxville, Tenn., plans Fontana Dam, on Little Tennessee River. $50,000,000. OPM asked Congressional approval.

N. C., Worthville—Leward Cotton Mills, Inc., office of Manager, Worthville, soon lets contract, dam imprvs. Over $15,000. R. H. Moore, Asheboro, engr.

★†**Tennessee**—Tennessee Valley Auth., Knoxville, plans Douglas Dam in French Broad River. $32,000,000. OPM asked Congressional approval.

BIDS ASKED

Bids Asked December 11

†**Miss., West Point**—Farm Security Admin., Donaghey Bldg., Little Rock, Ark., 5.7 mi. drainage ditches.

Bids Asked December 12

N. J., Long Branch—State, Bd. Commerce & Navigation, State House, Trenton, F. D. Holmes, dir. and secy., Project 169, coast protection structures, appurtenances, creosoted timber bulkhead, rock toe wall, etc., Atlantic Ocean shore front, $188,000; adv. ENR 12/4.

†**West Virginia** — U. S. Eng., Huntington, furnishing, del. Portland cement for Blustone Dam, Serial No. 516-42-84; adv. ENR 12/4.

Bids Asked December 15

†**Va., Richmond**—U. S. Eng., Norfolk, dredging 50,000 cu. yd. Richmond Harbor, James River.

Bids Asked December 17

La., East Point—Bd. Comrs. 19th Louisiana Levee Dist., Colfax, enlarging Four Mile Bayou Canal, for 3.3 mi., near here.

†**North Carolina**—U. S. Eng., 308 Customhouse, Wilmington, dredging 20,000 cu. yd. from Beaufort Harbor and 9,000 cu. yd. from waterway connecting Pimlico Sound and Beaufort Harbor.

Bids Asked December 18

†**Texas**—U. S. Eng., Post Office Bldg., Galveston, dredging 6,400,000 cu. yd. Sabine Pass Channel Sta. 280+00 to Port Arthur Canal Sta. 326+66.5, 6.64 mi.; adv. ENR 12/4.

†**Wash., Almira** — Bureau Reclamation, Denver, Colo., 230 kv. coupling capacitors and potential devices, carrier line traps for installation 230 kv. transmission lines, Grand Coulee Power Plant, Columbia Basin Proj., Spec. 1595-D.

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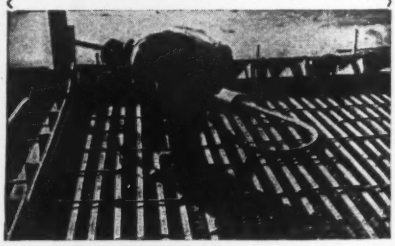

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EARTHWORK, ETC. (Bids Asked, Cont'd.)

Bids Asked December 20

★**Tex., Houston**—U. S. Eng., Federal Bldg., Galveston, Barker Dam, near Addicks, 14 mi. from here on Buffalo Bayou, for Harris County Flood Control & Imprvt. Dist. H. L. Washburn, aud., County Court house. $2,000,000. Extended date. A. C. Finn, Bankers Mortgage Bldg., engr. CD 11/18—ENR 11/27.

Bids Asked December 22

†**West Virginia**—U. S. Eng., Huntington, furnishing, del. 16 sluice gates, 10 complete assemblies, two emergency sluice gates, Bluestone Dam, near Hinton; adv. ENR 12/4.

Bids Asked December 29

Louisiana—U. S. Eng., Gulf Bldg., New Orleans, dredging, disposing materials from portions Mississippi-River-Atchafalaya River section Louisiana Texas Intracoastal Waterway, southeast Louisiana, base plant 1,075,000 cu. yd., alternate plan 595,000 cu. yd.

†**Oregon**—Bureau Reclamation, Bend, constructing Tunnels 1 and 2, North Unit Main Canal, Dechutes Project, near Terrebonne, Spec. 1019.

†**Pa., Plymouth**—U. S. Eng., 332 Post Office Bldg., Baltimore, Md., 2 pump. stations, 3 rein.-con. relief culverts; adv. ENR 12/4.

Bids Asked December 30

†**North Carolina**—U. S. Eng., Wilmington, dredging approx. 380,350 cu. yd. material from Pamlico and Tar Rivers; adv. ENR 12/4.

LOW BIDDERS

Calif., San Francisco — Municipal Park Comn., Park Lodge, Golden Gate Park, Nov. 24, yacht harbor exten., Unit 3, dredging rock and concrete walls, etc., for City and County of San Francisco, from Healy-Tibbitts Constr. Co., 1100 Evans Ave. **$25,966.** CD 11/13.

New Jersey—State Bd. Commerce & Navigation, 1060 Broad St., Newark, Nov. 24, from Thomas Proctor Co., Garfield Terrace, Long Branch, Proj. 162, creosoted timber bulkhead, repair in Shark River, Avon, **$66,918;** Proj. 163, creosoted timber bulkhead, etc., Bayhead-Manasquan Canal, Point Pleasant, **$50,940;** Proj. 171, rebuilding existing stone, steel core wall jetty by stone placement, Atlantic Ocean and East End Ave., Avon-by-the-Sea, **$25,250;** Proj. 172, (A) Class 1, rebuilding, exten. existing steel core and stone fill jetty by stone placement (B) Class 2, constructing timber fishing pier, Atlantic Ocean, 8 Ave., Belmar, (A) **$31,950** (B) **$22,000*****from Long Island Dredging Corp., 147-32 Jamaica Ave., Jamaica, N. Y., Proj. 164, dredging Inland Waterway Channel and anchorage basin Manasquan River, near Cook's Creek and Will's Hole Thorofare, Point Pleasant Beach, **$38,584***** from Hill Dredging Corp., 5601 Atlantic Ave., Ventnor, Proj. 167, dredging Inland Waterway Channel and removal of shoal areas, Broad Thorofare Longport, **$29,502;** Proj. 165, dredging Inland Waterway Channel in Little Bay, and in Reed Bay, Galloway, **54,366*****from Eastern Eng. Co., 4 North Carolina Ave., Atlantic City, Proj. 166, dredging Inland Waterway Channel and Anchorage Basin, Clam Creek, Atlantic City, **$75,600.** CD 11/10—ENR 11/13.

†**South Carolina**—U. S. Eng., Charleston, Nov. 25, removing 247,367 cu. yd. material from Shipyard river channel, Charleston Co., from Merritt Dredging Co., West Palm Beach, Fla., **$23,500.** CD 11/7—ENR 11/13.

★†**Tex., Freeport**—U. S. Eng., Federal Bldg., Galveston, Nov. 25, flood gates, bldgs., on Brazos River, Intercoastal Waterway, approx. 4 mi. southwest of here, from Tellepsen Constr. Co., 3900 Clay St., Houston, **$1,303,886.** CD 10/30—ENR 11/6.

CONTRACTS AWARDED

★†**Arkansas**—U. S. Eng., P. O. Box 60, Vicksburg, Miss., earthwork, west bank Mississippi River in Arkansas, Cypress Bend Levee, to H. B. Blanks Co., Jackson, Miss., **$645,772.** Bids 10/28. CD 10/10—ENR 10/16.

†**Fla., MacDill Field**—U. S. Eng., Jacksonville, dredging Hillsboro Bay, to Palm Beach Dredging Co., West Palm Beach. **$77,164.** Bids 11/10. CD 10/28—ENR 10/30.

Ia., Sioux City—Flood control work, Perry Creek. **WPA. $139,956.** C. A. Norrbom, city clk.

†**Missouri**—U. S. Eng., 601 Davidson Bldg., Kansas City, Mo., removing 40,000 yd. rock and 5,000 yd. earth from channel Missouri River between White Cloud and Atchison Bends, near St. Joseph, hired labor and government plant. **$60,000.** CD 11/12—ENR 11/20.

N. J., Jersey City—Hudson Co., Court House, filling in lowlands, 60,000 cu. yd. earth, excav. **WPA. $94,127.** F. Radigan, Court House, Co. engr.

†**O., Cleveland**—U. S. Eng., 960 Ellicott Sq. Bldg., Buffalo, N. Y., widening channel, enlarging turning basin Cleveland Harbor, Cuyahoga River Imprvt., to Great Lakes Dredge & Dock Co., Williamson Bldg., **$57,490.** Bids 11/5. CD 10/21—ENR 10/23.

†**Texas**—Dpt. Agriculture, Forest Service, Marshall, forest conservation, imprv. work,

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EARTHWORK, etc. (Contracts Awarded, Cont'd.)

ditching, drainage, etc., Jasper, Angelina, San Augustine and Sabine Counties, **WPA. $50,000.**

†**Tex., Port Lavaca**—U. S. Eng., Federal Bldg., Galveston, additional Lavaca River flood control work. **WPA. Approx. $40,000.**

Tex., Taylor—Williamson County Soil Conservation Dist., Taylor, c/o W. Lannen, waterways, ponds and terrace outlets, running lines, making soil fills, etc. **WPA. $57,781.**

UNCLASSIFIED

PROPOSED WORK

Ark., Hot Springs—TRACKS, etc.—Missouri Pacific R. R. Co., Missouri-Pacific Bldg., St. Louis, F. E. Bates, ch. engr., 10 mi. tracks to serve aluminum plant near here. $250,000.

Ark., Little Rock—HANGAR—Mayor, hangar, Adams Field, $120,000. Erhart & Eichenbaum, Gem Bldg., archt. Seeking WPA aid. CD 10/29—ENR 11/6.

★**Calif., Inglewood**—AIRPORT IMPROVEMENTS—Los Angeles Bd. P. Wks., City Hall Los Angeles, plans by J. Austin and S. Spaulding, Chamber of Commerce Bldg., Los Angeles, and takes bids after Jan. 1, 2 story, bsmnt., structural steel, rein.-con. administration and passenger bldg., air mail and express and appurtenant imprvs., landing field, Los Angeles Municipal Airport, Mines Field. $1,500,000. L. Aldrich, City Hall, Los Angeles, city engr. CD 5/13—ENR 5/15.

★**Calif., Long Beach**—PIER—Long Beach Harbor Dpt., for Pier 2 in Channel 3, Inner Harbor, $1,000,000; 3 berths, Pier D, exten. wharf, bulkhead, $730,000; transit shed at Pier A, $250,000; 200 ft. exten. to Pier B, outer Harbor.

★**Calif., Long Beach**—TRANSIT SHEDS, etc.—Long Beach Harbor Dpt., N. R. Shoemaker, part engr., 1333 W. El Embarcadero, bids soon steel frame, corrugated iron, rein.-con. transit shed, Berths 52, 53 and 54, $400,000; plans nearing completion transit shed addn. to shed, Berth 3, Pier A, $250,000.

†**Calif., Taft**—LANDING MAT—U. S. Eng., Wright Bldg., Sacramento, completing plans landing mat, Gardner Field, near here.

Fla., Daytona Beach—AIRPORT—W. Cunningham, mayor, City Hall, plans by A. McDonough, Daytona Beach, 120x120 ft. all steel hangar, concrete administration bldg., another hangar, Daytona Beach municipal airport. Over $125,000. W. P. Freer, Daytona Beach, WPA agt.

Illinois—RURAL ELECTRIC LINES—Illinois Iowa Power Co., Champaign, 29.25 mi. rural electric lines, Montgomery, Clinton, Jefferson, Gallatin, Saline, Washington and Marion Counties; 1.53 mi. line, St. Clair Co. I. Buys, Champaign, ch. engr.

Kansas—RURAL ELECTRIC LINES—Leavenworth Jefferson Electric Co., 281.11 mi. transmission lines, $265,000 REA allot. Black & Veatch, 4706 Broadway, Kansas City, Mo., engrs. CD 11/17—ENR 11/20.

Kansas—RURAL LINES—Smokey Valley Electric Co-op., Lindsborg, 118 mi. rural transmission lines. $102,000 REA allot. Paulette & Wilson, 1006 Kansas St., Topeka, engrs. CD 11/17—ENR 11/20.

★**La., Lafayette**—AIRPORT—Lafayette Police Jury, Lafayette, voted bonds enlarging airport, imprv. drainage. $500,000.

La., Monroe—AIRPORT—U. S. Eng., Vicksburg, Miss., airport, Selman Field. $388,000. CAA.

†**Mass., South Boston (Sta. Boston)**—DRY-DOCK CAISSON GATE—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., ashWash., D. C., welded steel caisson gate for Dry Dock 4, Naval Dry Dock, Spec. 10767.

Minnesota—RURAL ELECTRIC LINES—Red Lake Electric Co-operative, Inc., S. Singer, secy., Red Lake Falls, 52 mi. rural electric distr. sys. Red Lake and neighboring counties. Over $30,000. REA. C. J. Halstad, Halstad, engr

Nebraska—PIPELINE—Skelly Oil C.o, 605 W. 47 St., Kansas City, Mo., 10 mi. pipeline from Barada to Falls City, and pump. plant, Barada. $40,000. E. D. Smart, div. mgr.

Nebraska—RURAL ELECTRIC LINES, etc.—McCook Pub. Power Dist., McCook, G. H. Meyers, acting supt., 95 mi. rural electric transmission lines, Red Willow, Furnas, Frontier and Hitchcock Counties. $145,000. REA. Henningson Eng. Co., 626 Standard Oil Co. Bldg., Omaha, engrs. CD 11/13—ENR 11/20.

★†**Nev., Reno**—BOMBARDMENT AIR BASE—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., Bombardment Air Base, incl. field development, quarters for 5,000 men, bldgs., equip., utilities, etc. in vicinity of here. $9,500,000.

†**N. J, Millville**—AIRPORT IMPROVEMENTS—U. S. Eng., 2 and Chestnut Sts., Phila., Pa., grading, taxiways, triangular areas with drainage appurtenances, Millville Airport, to C. T. Burket, Vineland. $101,722.

Oklahoma—NATURAL GAS LINE—Continental Oil Co., Ponca City, made plans 6 mi. 4 in. natural gas line from Navina oil field to Edmond compressor station. $25,000. A. L. West, Ponca City, engr.

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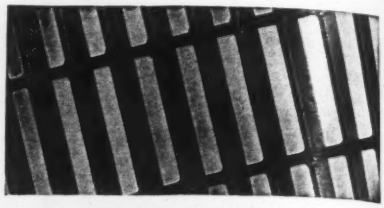

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★†**Oregon**—TRANSMISSION LOOP—Bonneville Power Admin., P. O. Box 3537, Portland, 57,000 volt transmission loop to serve industries, North Portland area.

Pa., Gaines—PRESSURE PLANTS—Bradley Producing Co., Bolivar and Wellsville, N. Y. pressure plants to force crude oil recovery, connecting pipelines, etc. $40,000-$50,000.

Pa., Greenville—SWIMMING POOL—Boro Council, S. T. Dean, burgess, municipal swimming pool, Packard Park. $25,000.

Pa., Wilkes-Barre—HANGAR—L. K. Eldridge, city clk., hangar, facilities, municipal airport. $25,000. G. B. Walker, city engr.

Pa., Wolf's Church (P. O. York)—PIPELINES, etc.—Sinclair Oil Co., 630 5 Ave., New York, N. Y., pipeline and bulk terminal, incl. storage tank farm 20 acre site, Hanover-Spring Grove Rd. $35,000.

South Dakota — RURAL LINES — James River Valley Assn., Groton, 181 mi. rural electric transmission lines, Brown Co. $160,000. REA. Buell & Winter Eng. Co., 508 Insurance Exch. Bldg., Sioux City, engr. CD 11/17—ENR 11/20.

Tenn., Nashville—IMPROVING PARK—T. L. Cummins, mayor, imprv., developing park site. $35,000. F. O. Beazley, city engr.

Tex., Alvin—ATHLETIC COURTS, etc.—L. Merchant, mayor, recreation center, athletic courts, concrete swimming pool, grading, drainage, leveling, etc. $60,000. Applied for DPW funds. Hedrick & Lindsley, 618 Southern Standard Bldg., Houston, engr. CD 9/26—ENR 10/2.

Tex., Brownsville—AIRPORT IMPROVEMENTS—U. S. Eng., Federal Bldg., Galveston, bids soon airport imprvts. paving 4,5000 ft. runways, taxi strips, lighting sys., etc. $437,-000. CAA. W. O. Washington, Brownsville, city engr. CD 8/21—ENR 8/28.

Tex., Corpus Christi—AIRPORT—A. C. McCaughan, mayor, voted bonds airport imprvs., ground work, drainage. $50,000. G. Blackburn, city engr. CD 11/19.

★**Tex., Corpus Christi**—BAYFRONT STAGE, etc.—A. O. McCaughan, mayor, voted bonds rein.-con. bayfront stage, appurtenances, $150,-000; grading, filling in, athletic courts, swimming pools, playground facilities, $100,000, will apply for federal funds for both projects; bridges, street imprvs. $500,000. G. Blackburn, city engr. CD 11/7—ENR 11/13.

Tex., Edinburg—GAS SYSTEM—A. A. Aldrich, mayor, purch., imprv. natural gas sys. $250,000.

Tex., Katy—PIPELINES—Humble Oil & Gas Co. & Associates, Humble, and Humble Bldg., Houston, installing network pipelines, connecting wells with refining plant, etc. $300,000.

Tex., Lufkin—AIRPORT IMPROVEMENTS—Angelina Co., c/o Judge, Lufkin, airport imprvs. $90,000 bonds voted.

†**Tex., Midland**—AIRPORT IMPROVEMENTS—U. S. Eng., Federal Bldg., Galveston, bids soon additional imprvs. grading, draining, paving runways, taxi strips, etc., for Advanced Twin-Engine Air Corp School, $250,000. CD 9/3—ENR 9/11.

†**Tex., Pottsboro**—AIR SCHOOL FACILITIES—U. S. Eng., Citizens Bank Bldg., Denison, bids soon ordnance facilities, 1 chemical bomb magazine, SH-10, 1 SA Ammunition Bldg. SA-1, 1 pyrotechnics magazine, roadway, drainage structures, ditches, etc., Air Corps Basic Flying School, Grayson Co.

†**Tex., San Antonio**—AIRPORT IMPROVEMENTS—U. S. Eng., Federal Bldg., Galveston, leasing, imprv. 294 acres adjacent city airport, incl. new runways, hangars, sewers, field drainage, leveling. $225,000.

★**Wash., Chehalis**—AIRPORT GRADING, etc.—U. S. Eng., Central Bldg., Seattle, bids soon grading field for airport, constructing 2 landing strips, 50x4,500 ft. taxiway, dike around 3 sides of field, paving 150x4,000 ft. runway. $523,000. CAA. CD 8/21—ENR 8/28.

Wash., Kirkland—LANDSCAPING, etc.—King Co., County-City Bldg., Seattle, landscaping 10 acre area, clubhouse, log shelter, playground, drinking fountains, sprinkling sys., septic tanks, kitchens, etc. $63,000. WPA funds sought. J. R. Heath, County-City Bldg., Seattle, engr.

†**Wash., Pasco**—AIR BASE—U. S. Eng., Central Bldg., Seattle, military air base.

Wis., Janesville—AIRPORT—Rock Co., airport. $45,000 site appropriation.

Alta., Lloydminster—AIRPORT—Municipality, c/o G. L. Cooke, mayor, airport, 4 mi. south of here. $100,000.

Alta, Vermilion—WELL DRILLING, etc.—Acme Gas & Oil Co. Ltd., Vermilion, well drilling and pipeline. $40,000.

B. C., New Westminster—SHIPBUILDING YARD—Dominion Govt., Ottawa, Ont., steel shipbuilding yard, Fraser River. $250,000. Dpt. Munitions & Supply, Ottawa, Ont., engrs.

B. C., Vancouver—GROUND SCHOOL—Flying Seven Aeronautical Club, c/o City Clerk, aeronautical ground school, hangar, etc. $50,-000.

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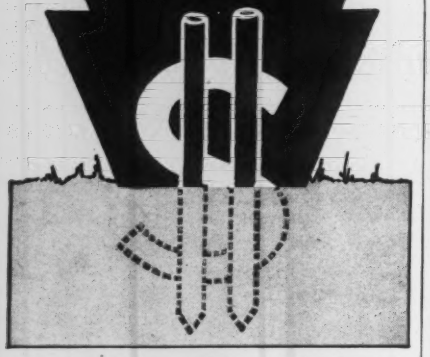

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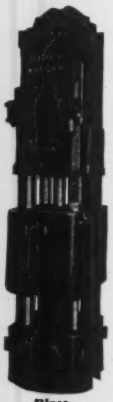

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UNCLASSIFIED. (Proposed Work, Cont'd.)

Ont., Gravenhurst — LANDING FIELD—Royal Norwegian Air Force, 341 Church St., Toronto, bids soon emergency landing field. About $175,000.

Que., Verdun—STREET LIGHTING—Municipality, street lighting on 15 streets. $30,000. H. Handley, City Hall, engr.

★**Sask., Maple Creek**—TRAINING CENTRE, etc.—Secy. Dpt. Munitions & Supply, Ottawa, Ont., bids soon Militia Training Centre, various bldgs., drill ground, for Dpt. National Defense, Ottawa, Ont. About $600,000.

BIDS ASKED

Bids Asked After December 8

Nebraska—RURAL ELECTRIC LINES—Madison County Rural Public Power Dist., Battle Creek, 363 mi. transmission lines. $317,000. H. S. Nixon, Grain Exch. Bldg., Omaha, engr. CD 11/17—ENR 11/20.

Bids Asked December 11

†**Wash., Yakima**—OIL CIRCUIT BREAKER—Bonneville Power Administration, P. O. Box 3537, Portland, Ore., oil circuit breaker, for new substation, Inv. 2429.

Bids Asked December 15

Calif., Lone Pine and **Independence**—AIRPORT IMPROVEMENTS—U. S. Eng., 751 S. Figueroa St., Los Angeles, clearing, grading, asphaltic concrete paving, Lone Pine-Independence Airport, for cities of Lone Pine and Independence. Over $75,000. CAA.

Nebraska—RURAL ELECTRIC LINES—Madison County Rural Public Power Dist., Battle Creek, 363 mi. rural electric transmission lines, Antelope, Wheeler, Holt, Pierce, Boone & Madison Counties. $317,000. H. S. Nixon, Grain Exch. Bldg., Omaha, engr. CD 12/1—ENR 12/4.

Bids Asked December 16

Alabama — AIRPORT IMPROVEMENTS — U. S. Eng. Federal Bldg., Mobile, airport imprvs., clearing, grubbing, draining, topsoiling, sodding, landing straps, paving 150x4,000 ft. and 500x2,000 ft. runways, airport between Auburn and Opelika. $250,000. CAA.

Bids Asked December 17

†**Mich., Mount Clemens**—GASOLINE TANKS, etc.—U. E. Eng., 613 Federal Bldg., Detroit, installing six 25,000 gal. gasoline storage tanks, removing 2½ in. control apparatus from 6 gasoline tanks, installing 4 in. fill, Selfridge Field; adv. ENR 12/4.

Bids Asked December 22

†**Md., Aberdeen Proving Ground**—RUNWAYS, etc.—U. S. Eng., 332 Post Office Bldg., Baltimore, runways, taxiways, aprons, Aberdeen Proving Ground Airfield; adv. ENR 12/4.

Bids Asked

Calif., Redwood City—SILOS—Permanente Materials Corp., Los Altos, six 72 ft. silos, set on piling, pipelines to docks, pump. and unloading houses, Port of Redwood City.

LOW BIDDERS

Calif., Eureka—RUNWAYS, etc.—U. S. Eng., 401 Customhouse, San Francisco, Nov. 24, runways, taxiways, apron and appurtenant facilities, Eureka Airport, 2 mi. north of McKinleyville, from John Carlin Constr. Co., P. O. Box 879, Redding. **$295,332.** Est. $292,310. CAA. CD 11/19.

South Carolina — TRANSMISSION LINE CONDUCTOR, etc.—South Carolina Pub. Serv. Auth., Charleston, Nov. 25, transmission line conductor, insulators, hardware, Santee-Cooper hydroelectric project, from Perry-Mann Electric Co., 1609 Main St., Columbia. **$381,244.** CD 11/24, under Earthwork, etc.

CONTRACTS AWARDED

Ark., Hot Springs—PIPELINE — Arkansas, Louisiana Gas Co., 300 W. Capitol St., Little Rock, 80 mi. 16 or 18 in. pipeline from southwest Arkansas to site new aluminum plant, near here. Owner builds. **$85,000.**

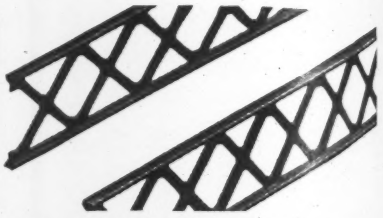
★†**Calif., Long Beach**—LANDING FIELD—U. S. Eng., 751 S. Figueroa St., Los Angeles, landing field, A. C. ferrying command, to James I. Barnes Constr. Co., Central Tower Bldg., Santa Monica, **$517,688.** Bids 11/1. CD 11/6—ENR 11/13.

†**Fla., MacDill Field**—BULKHEAD, etc.—U. S. Eng., P. O. Box 4970, Jacksonville, wooden bulkhead, marginal wharf, wooden wall, wooden piers, to E. A. Forbes, Palm Beach. **$72,916.** Bids 10/27. CD 10/20.

†**Fla., Panama City**—GASOLINE FUELING SYSTEM—U. S. Eng., P. O. Box 4970, Jacksonville, gasoline fueling sys. for Air Corps, Tindall Field, near here, to Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y. **$76,360.** Awarded 11/19.

★†**Md., Sparrows Point (Br. Baltimore)**—SHIPWAYS—Bethlehem Shipbuilding Co., 3 steel, concrete shipways and shop bldg. for U. S. Maritime Com., 14 St. between E St. and Constitution Ave. N. W., Wash., D. C., to McLean Contg. Co., 1301 Fidelity Bldg., Baltimore, est. **$2,000,000.** CD 10/28—ENR 10/30.

N. J., Jersey City—REPAIR YARD—Erie R.R. Co., foot of Pavonia Ave., I. H. Schram, engr. Maintenance and Ways, marine repair



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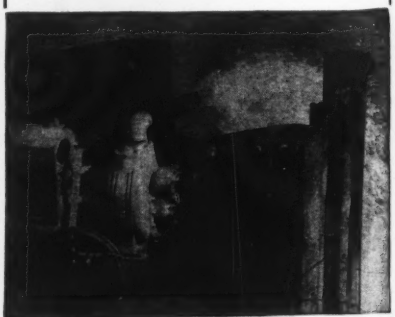

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yard with boiler shops, machine shop and mooring racks, 7 St. and Hudson River, to Geo. W. Rogers Constr. Co., 6 Church St., New York, N. Y. **$300,000.** Bids 11/7. CD 11/3—ENR 11/6.

★**N. J., North Haledon**—RACE TRACK, Etc.—Garden City Racing Assoc., c/o A. Mori, 614 Landis Ave., Vineland, 1 mi. dirt horse racing track, steel, concrete grandstand, clubhouse, stables, etc. Route 40, to Edward H. Ellis, Inc., 912 Bway., Westville. **$1,500,000.** Sloan & Behrens, 420 Lexington Ave., New York, N. Y., archts. J. C. Remington, Jr., 509 Cooper St., Camden, engr.

†**N. M., Clovis**—AIR NAVIGATION FACILITIES—U. S. Eng., Caddoa, Colo., air navigation facilities, Clovis Airport, Serial No. W 911-42-14, to Henry Thyfesen & Co., Albuquerque. **$271,980.** Bids 11/7, awarded 11/18. CD 10/27—ENR 10/30.

N. Y., Brooklyn—SUBSTATION—Robins Dry Dock & Repair Co., Erie Basin, 2 story, 26x61 ft. electric substation to Irons & Reynolds, 420 Lexington Ave., New York. Est. **$25,000.** Bids 11/17. CD 11/12—ENR 11/20.

†**N. Y., Pine Camp**—SPORTS ARENA—Con. Q.M., sports arena, to John W. Cowper Co., Inc., Sidway Bldg., Buffalo. **$35,960.** Bids 11/21.

O., Sandusky—RAILROAD TRACK RELOCATION—E. B. Badger & Sons, Feick Bldg., Cleveland, railroad track relocation for Plum Brook ordnance plant, to George Vang, Inc., Grant Blk., Pittsburgh, Pa. **$335,000.**

Texas—PIPELINE—Texas Pipe Line Co., Philtower Bldg., Tulsa, Okla., 90 mi. 6 in. steel welded joint pipeline, in Seminole. Owner builds. Approx. **$110,000.**

Tex., Corpus Christi—AIRPORT IMPROVEMENTS—A. C. McCaughan, mayor, constructing, paving, airport runways, taxi strips, Cliff Maus municipal airport, to Brown & Root, P. O. Box 3, Houston, and Corpus Christi. **$281,467.**

Tex., Freeport — GAS LINES, UTILITIES, etc.—Dow Magnesium Co., Velasco, installing gas lines, sanitary sewers, water lines and facilities, paving, etc. in dwelling construction area for plant workers. Purchase and Hire and sub-contracts. Approx. **$225,000.**

Tex., Gilmer—SUBSTATIONS, etc.—Farmers Electric Generating Co-operative, c/o H. P. McGaughy, pres., Gilmer, 8 substations, to Sandberg-Johnson Constr. Co., Hampton, Ia., **$120,878.** Bids 11/12. CD 10/28—ENR 10/30.

Tex., Houston—AIRPORT—C. A. Pickett, mayor, airport drainage, to H. M. Ansley, 6714 Peerless St., approx. **$35,000.**

Tex., Marshall — GRADING, etc. — Texas State Park Bd., Austin, imprv. Caddo Lake and area, near here, incl. leveling, grading, drainage, drives, walks, landscaping, athletic grounds, swimming facilities. **WPA. $125,983.**

★†**Territory of Hawaii**—AIR BASES—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., additional facilities in Hawaii and Islands of the Pacific, Contr. NOY 4173, Supplemental Agreement 2, to Hawaiian Associates, 420 Lexington Ave., New York, N. Y. **$59,887,910.** Additional to 5/9—ENR 5/19, under Midway Island, CA.

B. C., Boundary Bay—AERODROME—Dpt. National Defense for Air, Ottawa, Ont., aerodrome development, stripping, grading, hard surface runway, to Dawson Wade & Co., Ltd., 775 Clark St., Vancouver. About **$55,300.**

★**Labrador**—NAVAL BASE, etc.—Dpt. National Defense for Sea, Ottawa, Ont., naval base, water and sewerage sys., houses, stores, roads, machine shops, naval docks, etc., to Dominion Constr. Corp. Ltd., 217 Bay St., Toronto, Ont. About **$2,500,000-$3,000,000.**

Man., Hartney—AERODROME—Secy. Dpt. Munitions & Supply, Ottawa, Ont., additional temporary accommodations, Relief Intermediate Aerodrome, for Dpt. National Defense for Air, Ottawa, Ont., to Claydon Co. Ltd., 290 Garry St., Winnipeg. **$85,000.** Bids 10/16. CD 10/10—ENR 10/16.

Man., Winnipeg—HANGAR—Dpt. National Defense for Air, Ottawa, Ont., assembly hangar, Stevenson Field, St. James, near here, to Fraser, MacDonald & Co., Somerset Bldg. **$90,000.**

Newfoundland—POWER LINE — Dominion of Canada, Ottawa, Ont., power line, Harbour Grace, to United Towns Electric Co. Ltd., St. Johns. Est. **$35,000.** Dpt. Munition & Supply, Ottawa, Ont., engrs.

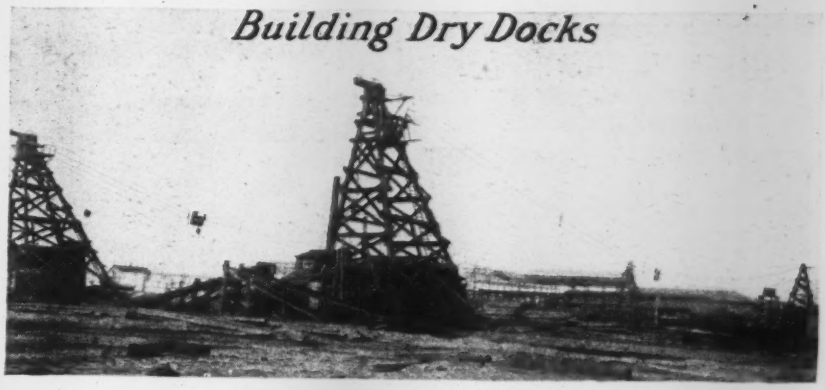
N. S., Sydney—OIL WHARF—Dpt. National Defense, Ottawa, Ont., oil wharf, to R. M. Hall Constr. Co., Ltd., 8 Norwood Ave., Halifax, **$24,995.** Bids 10/23. CD 10/16.

Ont., Centralia—TRAINING SCHOOL—Dpt. National Defense for Air, Ottawa, wood buildings, S.F.T. School, to Sterling Constr. Co. Ltd., 2492 Sandwich St. E., Windsor. **$91,000.**

Ont., Mohawk—AERODROME—Dpt. Transport, Ottawa, Ont., aerodrome development, Relief 1 to Trenton, grading, drainage, hard-surfaced runway, taxi strip fencing, to King Paving Co. Ltd., Oakville. About **$185,000.**

LIDGERWOOD CABLEWAYS

Building Dry Docks



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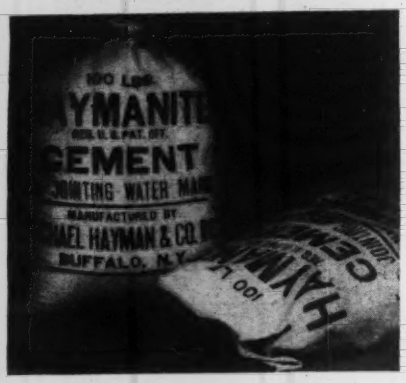

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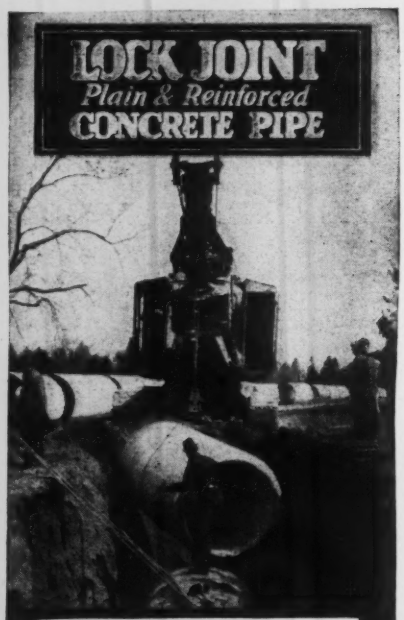

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Ont., Mount Hope—TAXI STRIP, etc.—Dpt. National Defense for Air, Ottawa, taxi strip exten., drains, appurtenances, Air Navigation School, to Sterling Constr. Co. Ltd., 2494 Sandwich St. W., Windsor. About **$45,000.**

Sask., Prince Albert—AIRPORT—Dpt. National Defense for Air, and Dpt. Transport, Ottawa, Ont., grading, concrete taxi strip, to C. Mamegasg & J. Rollock, Prince Albert. **$29,000.**

LATIN AMERICA

Mexico—Dpt. Navy, c/o Mexican Government, Mexico City, plans developing new facilities for Naval Bases, Magdalena Bay, Salina Cruz and Acapulco.

South America, Brazil—Municipality **Rio de Janeiro,** plans hotel at or near Sugar Loaf Mountain at entrance Rio Harbor, $1,000,00 ***Syndicate, c/o Municipality **Bahia,** plans hotel near Pauls Afonso Falls, $750,000, Engineer c/o Cidade do Salvador de Bahia*** Ministry of Agriculture, c/o acting Minister Dr. Carlos de Sousa, Duarte, **Rio de Janeiro,** factory for wax production, $175,000. Engineer c/o Council of Foreign Trade, Rio de Janeiro***Government of Brazil, Rio de Janeiro, plans glass factory, **Sao Goncalo,** $100,000, Federal Council of Foreign Trade, Rio de Janeiro, engrs. Central do Brazil R. R., c/o Major Napoleas A. Guimarcles, **Rio De Janeiro,** plans electrification railroad as far as Volta Redonda, $300,000.

PUBLIC BUILDINGS

PROPOSED WORK

†**Ala., Dothan**—U. S. Eng., Wash., D. C. 120 x 160 ft. engineering shop.

†**Ala., Montgomery**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop, Gunter Field.

†**Ala., Selma**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

†**Ariz., Phoenix-Higley**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

†**Ariz., Phoenix**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop, Luke Field.

†**Ariz., Tucson**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

Ark., Little Rock—Arkansas State Hospital Bd., Dr. A. C. Kolb, supt., Little Rock, plans by T. Harding, Donaghey Bldg., dormitory. $300,000.

†**Calif., Bakersfield**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

†**Calif., Lemoore**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

†**Calif., Mather Field**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

†**Calif., Merced**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

†**Calif., Sacramento** — Div. Defense Housing, 811 Vermont Ave. N.W., Wash., D. C., 457 defense housing units.

†**Calif., Stockton**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineernig shop.

†**Calif., Taft**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop, Gardner Field.

†**Calif., Victorville**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

★†**Colo., Denver**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., expanding ordnance plant, for manufacture small arms ammunition. Additional to CD 1/17—ENR 1/23, under CA.

†**Conn., Groton**—Town, S. B. Butler, supt. Schools, bids soon school, Pleasant Valley Rd., Docket Conn. 6-113. $150,000. **DPW.** E. L. Scholfield, 309 State St., New London, archt. CD 10/16—ENR 10/23.

Conn., Middletown—H. Hanson, chn. City Building Com., 134 Mt. Vernon St., sketches by C. E. Segerbert, 57 Barbara Rd., 2 story, bsmnt., brick, steel trade school. $200,000.

★†**Conn., New Haven**—New Haven Housing Auth., 300 brick defense housing units, Project 6101. $1,100,000. CD 7/29—ENR 7/31.

†**Conn., Stratford**—Town, W. H. Shea, town mgr., bids soon 1 story, brick, steel Franklin School addn., Docket Conn. 6-135. **DPW.** C. W. Walker, 1115 Main St., Bridgeport, archt. CD 10/30—ENR 11/6.

†**Conn., Stamford**—Div. Defense Housing, 811 Vermont Ave. N.W., Wash., D. C., 200 defense housing units, near here.

†**Fla., Eglin Field**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

★†**Fla., Jacksonville** — Duval County Bd. Public Instruction, acting for Special Tax School Dist. 1, bids soon, 4 schools, one each in suburbs Venetia, North Shore, Lake Shore and Docket Station, Fla. 8-164. $750,000. **DPW.** CD 11/14—ENR 11/20.

★**Fla., Miami**—F. Stearns, secy. City Planning Bd., plans city hall, etc. $1,000,000.

†**Fla., Panama City**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

†**Fla., Sebring**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

†**Fla., Sebring**—Div. Defense Housing, 811 Vermont Ave. N.W., Wash., D. C., 93 defense housing units, near here.

†**Ga., Albany**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop, Air Depot.

†**Ga., Atlanta**—Con. Q.M., 494 Spring St. N.W., Atlanta, nurses' recreation bldg., utilities, Lawson General Hospital. **DPW.** CD 10/22—ENR 10/30.

Ga., Atlanta—Bd. Comrs. Fulton Co., Atlanta, plans by A. T. Bradbury, Wm. Oliver Bldg., 1 and 2 story almshouse. $150,000.

Ga., La Grange—Bd. Educ., school bldgs. $190,000.

†**Ga., Macon**—U. S. Eng., 120x160 ft. engineering shop, Cochran Field.

†**Ga., Moultrie**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

†**Ga., Valdosta**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

Ill., Geneseo — Imprv. municipal electric light and power plant, new Diesel engine. Over $40,000. S. Ogden, city engr.

†**Ind., Burns City**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., power plant for Burns City Depot.

★†**Ind., East Chicago** — American Steel Foundries Co., 410 S. Michigan Ave., Chicago, Ill., plans by Albert Kahn & Associates, 345 New Center Bldg., Detroit, Mich., plant for manufacture tank equip., for War Dpt. $9,000,000. R. D. Brizzolara, c/o lessee, engr. Defense Plant Corp. will finance. CD 10/4—ENR 10/9.

★†**Ind., East Chicago**—Continental Roll & Steel Fdry. Co., 4407 Railroad Ave., plant for production ordnance equip., for War Dpt. $1,444,488 for land and bldgs., $4,049,000 for machinery and equip. Defense Plant Corp. will finance.

★†**Ia., Burlington**—Con. Q.M., Burlington, 4 additional inert storage bldgs., Iowa Ordnance Plant. $500,000.

Ky., Paris—Massie Memorial Hospital, c/o Dr. Purcell, supt., and J. W. Clopfelter, chn. Building Com., voted bonds 2 story, brick hospital, separate ward for negro patients. $200,000. Samual Hannaford & Son, Dixie Terminal Bldg., Cincinnati, O., and S. C. Molloy, Republic Bldg., Louisville, archts. CD 10/17—ENR 10/23.

†**La., Lake Charles**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

Minn., New Ulm—A. C. Sannwald, city clk., furnishing, placing on foundation, 5,000 kw turbine, municipal power plant. Over $40,000. R. D. Thomas & Associates, 1200 2 Ave S., Minneapolis, engrs.

Minn., St. Paul—State Hy. Dpt., 1246 University Ave., plans by Magney, Tusler & Setter, 202 Foshay Tower, Minneapolis, 1 story, 125x134 ft. and 84x85 ft., brick, tile, L-shaped central shop bldg. addn., State Fair grounds. $150,000.

†**Miss., Biloxi**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

†**Miss., Columbus**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

†**Miss., Greenville**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

†**Mont., West Yellowstone**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., rebuilding garage, destroyed by fire. $30,000.

†**Nev., Las Vegas**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

N. J., Clifton—Bd. Educ., City Hall, plans by Hugh A. Kelly & Assoc., Hunt Bldg., Hanover St., Trenton, 2 story, bsmnt., brick steel Grade School 2. $150,000. Applied for DPW funds.

†**N. J., Little Falls**—Bendix Aviation Corp., 30 Rockefeller Plaza, New York, N. Y., aeroplane parts factory imprvs., addns. Defense Plant Corp. will finance.

†**N. M., Albuquerque**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

N. Y., Corona (Sta. Flushing)—Dpt. P. Wks., Municipal Bldg., New York, plans by G. M. Malcolm, c/o owner, 2 story machine shop, 41-02 123 St. $97,000.

†**N. Y., Brooklyn**—Brooklyn Housing Auth., 7 defense housing units for USHA.

N. C., Greensboro—University of North Carolina, Chapel Hill, student union bldg., Woman's College. $184,000.

N. C., Statesville—Iredell Co. Bd. Educ., J. C. Fowler, chn., voted bonds school imprv. program. $270,000. CD 10/24—ENR 10/30.

Okla., Bartlesville—Washington County Hospital, R. Y. Evans, secy., plans by A. Gorman, Bartlesville, hospital addn. $150,000.

†**Okla., Enid**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

Okla., Enid—Plans by R. W. Shaw, Enid, soldiers' recreation center. $150,000. Bond election soon. Applied to DPW.

Pa., Bedford—Bedford School Dist., E. R. Robb, superv. principal, Bedford, rebuilding high school, destroyed by fire. Over $150,000.

†**R. I., North Kingston**—Town, plans by E. O. Eckman, 72 Weybosset St., Providence, school, Docket R.I. 37-125, $175,000. **DPW.** CD 10/7—ENR 10/9.

PUBLIC BLDGS. (Proposed Work, Cont'd.)

†**R. I., Newport**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., bids soon brick, steel hospital addn., for Corpsmen, Spec. 10758, $190,000; brick, steel laundry, Naval Training Station, Spec. 10723.

†**S. C., Sumter**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

Tenn., Chattanooga — City and County Health Dpt., Chattanooga, isolation hospital. $150,000.

Tenn., Knoxville—Knox County Bd. Educ., Knoxville, L. H. Brickey, supt., negro technical high school. $150,000.

Tenn., Oakville—State, Dpt. P. Health, Dr. W. C. Williams, comr., 40 6 Ave., Nashville, sanitarium. $150,000.

Tex., Austin—Bd. Directors Texas Students Publications, Inc., c/o University of Texas, Austin, publications bldg. $50,000.

★†**Tex., Camp Barkeley**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., replacement center, 2 story barracks, etc. $7,220,000.

★†**Tex., Corpus Christi**—City voted $500,000 bonds, four 5 story hospital bldgs., 4 story nurses' home, 5 story tubercular bldg., 2 story utility bldg., Tex. 41-230. **DPW**, Brock, Roberts & Anderson, Jones Bldg., Corpus Christi, archts. Matthews & Kenan, Smith Young Tower, San Antonio, engrs. Voted bonds central fire station, $175,000. G. Blackburn, city engr. CD 11/7—ENR 11/13.

Tex., Edinburg—A. A. Aldrich, mayor, purchasing, imprv. electric light power plant and distr. sys. $300,000. CD 11/12—ENR 11/2.

†**Tex., Grand Prairie**—Grand Prairie Independent School Dist., G. W. Spikes, pres., bids soon 122x146 ft., brick, concrete, stone grade school and 2 story high school unit, Docket Tex. 41-233. $178,752. **DPW**, R. P. De Witt, Praetorian Bldg., Dallas, archt. CD 11/7—ENR 11/13.

†**Tex., Harlingen**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

†**Tex., Houston**—U. S. Dist. Eng., Federal Bldg., Galveston, 1 story, 120x160 ft. engineering shop, Ellington Field.

Tex., Houston—Bd. Educ., public school athletic, education and recreation center, stadium, WPA. $223,056.

Tex., Houston—C. A. Pickett, mayor, 1 story, 125x250 ft., brick, hollow tile, plaster recreation bldg., facilities. $336,000. Applied for DPW funds.

†**Tex., Lubbock**—U. S. Eng., Wash., D. C., 120x160 ft. engineering shop.

†**Tex., Lubbock** — Lubbock Independent School Dist., A. C. Jackson, bus. mgr., plans by Haynes & Strange, school bldg., Tex. 41-306. $121,600. **DPW**. CD 11/14—ENR 11/20.

†**Tex., Midland**—U. S. Eng., Citizens Bank Bldg., Denison, 1 story, 120 x 160 ft. engineering shop.

†**Tex., Mission**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

†**Tex., Pottsboro**—U. S. Eng., Wash., D. C., engineering shop for servicing airplanes, vicinity of here.

†**Tex., San Angelo**—U. S. Eng., Federal Bldg., Galveston, 1 story, 120 x 160 ft. engineering shop bldg., Goodfellow Field.

†**Tex., San Antonio**—U. S. Eng., Federal Bldg., Galveston, 1 story, 120 x 160 ft. engineering shop bldg., Brooks Field.

†**Tex., Sherman-Denison**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

Tex., Terrell—P. I. Austin, city mgr., power plant imprvs., new bldg., etc. $185,648. Applied for DPW funds. Albert C. Moore & Co., 2404 Smith-Young Tower, San Antonio, engrs. CD 10/21—ENR 10/23.

†**Tex., Victoria**—U. S. Eng., Federal Bldg., Galveston, 1 story, 120 x 160 ft. engineering shop.

†**Tex., Wichita Falls**—U. S. Eng., Wash., D. C., 120 x 160 ft. engineering shop.

★†**Utah, Provo** — Columbia Steel Co., Russ Bldg., San Francisco, Calif., plant for use in production pig iron, steel and steel plates, near here, for OPM. $91,000,000. Defense Plant Corp. will finance.

★**Va., Richmond** — Richmond Housing Auth., T. Cockrell, exec. secy., plans by Marcellus Wright & Son, 1103 E. Main St., 190 dwelling units, VA. 7-3. $855,000. USHA. CD 11/11—ENR 11/13.

★**Man., Winnipeg**—Wartime Housing, Ltd., 55 York St., Toronto, Ont., 500 houses. $1,000,000.

Que., Quebec City—R. C. Episcopal Corp. of Quebec, Quebec City, church and residence for Parish of Our Lady of Peace. $150,000.

Que., Shawinigan Falls—Dominion Govt., Ottawa, Ont., munition plant. $250,000. Dpt. Munitions & Supply, Ottawa, Ont., engrs.

BIDS ASKED

Bids Asked December 9

†**Md., Baltimore**—Maryland Drydock Co., Fairfield, Baltimore, 1 and 2 story, 135x160 ft., steel, concrete machine shop, for Navy Dpt. $100,000. J. E. Greiner Co., 1201 St. Paul St., engr. CD 11/19—ENR 11/27.

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PUBLIC BLDGS. (Bids Asked, Cont'd.)

†N. C., Charlotte—U. S. Eng., Charleston, S. C., 2 company supply rooms (mobilization) Charlotte Air Base, Cir Pro. No. 231-42-27.

O., Cleveland—Cleveland Metropolitan Housing Auth., West Mall Dr., E. J. Bonn, secy., 1,300 unit housing, Proj. Ohio 3-8. USHA. Extended date. CD 11/24—ENR 11/20.

Pa., Cresson—Commonwealth of Pennsylvania, State Auth. Bd., D. Diehl, dir., Harrisburg, 2 story, bsmnt., 38x105 ft., local stone, concrete slab over steel surgical buildings completion. R. G. Howard, 340 Deposit Natl. Bank Bldg., Du Bois, archt.

†N. Y., Watervliet—Con. Q.M., Watervliet Arsenal, general construction, not incl. structural steel, Liner Shop GL and Gun Shop GF addns.

†Va., Alexandria—Con. Q. M., Alexandria Quartermaster Depot, Duke St. Extended, U. S. O. recreation bldg.; adv. ENR 12/4.

Bids Asked About December 10

†Okla., Enid—U. S. Eng., Wright Bldg., Tulsa, Okla., 3 ordnance storage bldgs., bituminous surfaced gravel streets and driveways, water and gas lines, landing field.

†Mass., Watertown—Con. Q.M., Watertown Arsenal, brick, steel Bldg. 41 addn. J. R. Worcester & Co., 79 Milk St., Boston, engrs. CD 11/27.

†N. J., Pedricktown—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D.C., garage flagpole, etc. Delaware Ordnance Depot.

†Pa., Phila.—Yards & Docks, Navy Dpt., 18 St., and Constitution Ave. N.W., Wash., D. C., Service Bldg. 634, Navy Yard, Pier 6, Spec. 10610.

†Va., Fort Monroe—Con. Q.M., Fort Monroe, ordnance machine shop addns.; adv. ENR 12/4.

Bids Asked December 11

†Ark., Lewisville—Farm Security Admin., Donaghey Bldg., Little Rock, farmstead unit bldgs.

†Miss., Fayette—Farm Security Admin., Donaghey Bldg., Little Rock, Ark., farmstead unit bldgs.

†Pa., Aliquippa — Beaver County Housing Auth., R. Bennett, chn., Court House, Beaver, 50 defense housing units, Project 36058-X, for USHA. Extended date. A. Martsolf, G. E. Trent & H. Bradley, 9 St., Monaca, archts. E. S. Tower, 213 Investment Bldg., Pittsburgh, engr. CD 11/24—ENR 11/27.

†Tex., Ysleta — Supt. Ysleta Independent School Dist. of El Paso Co., brick, rein.-con. high school unit and imprvs., Docket Tex. 41-148 and 149. Approx. $160,000. **DPW.** P. McGhee, 425 1st Natl. Bank Bldg., El Paso, archt. CD 9/23 and 10/28—ENR 9/25 and 10/30.

Wash., DuPont—School Dist. 7, school addns. $150,000. W. Mallis, Lyon Bldg., Seattle, archt. CD 11/14—ENR 11/20.

†Wash., Seattle—Pub. Bldgs. Admin., 7 and D Sts. S.W., Wash., D. C., relocating laundry, etc., U. S. Immigration Station and Assay Office.

Bids Asked December 12

†Conn., Stratford—Town Engineers Office, Town Hall, brick, steel Lordship School addn. Docket Conn. 6-145. $70,479. **DPW.** Frederick H. Beckwith, 19 Post Office Arcade Bridgeport, archt. CD 10/30—ENR 11/6.

†N. H., Portsmouth — Pub. Wks. Officer, Navy Yard, Portsmouth, oil storehouse, Portsmouth Navy Yard, Spec. 10695. CD 11/25—ENR 11/27.

†Colo., Fort Logan—Pub. Bldgs. Admin., 7 and D Sts. S.W., Wash., D. C., additional site work, etc. (construction garage, parking stubs, etc.), for defense housing.

Bids Asked About December 15

†Ariz., Tucson—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., administration bldg. and 3 warehouses.

†S. C., Charleston—Pub. Wks. Officer, Navy Yard, Charleston, married personnel quarters, bachelor quarters, operating bldg. transmitter bldg., U. S. Naval Radio Direction Finder Station, Dupont, Charleston Co.

Wash., Tacoma—Furnishing 3 turbines, 3 generators for power plant expansion. Extended date. CD 10/29—ENR 11/6, under BA.

Bids Asked December 16

Calif., Bakersfield—Kern County Housing Auth., 3801 N. Chester Ave., 50 unit housing, Proj. Calif. 8-2,; 62 unit housing, Valle Vista, Delano, Proj. Calif. 8-3; 50 unit housing, Monte Vista, Arvin, Proj. Cal. 8-4. Extended date. USHA. CD 11/19—ENR 11/6.

†Mo., Fort Leonard Wood—Con. Q.M., four 250-m mess, type theatre of operations, 2 vehicle sheds, etc.; adv. ENR 12/4.

Neb., North Platte—S. W. Throckmorton, city clk., municipal light and water department bldg. $40,000. C. C. Coursey, city archt. CD 3/11—ENR 3/13.

Bids Asked December 17

†Colo., Fort Logan—U. S. Eng., 17 Ave. and Jackson St., Omaha, Neb., telephone and telegraph office.

Ga., Augusta—Augusta Housing Auth., H. R. Powell, exec. dir., Olmstead Homes extension Housing, Proj. GA 101A. $300,000. USHA. Extended date. Merry & Parsons, S. F. Bldg., archts. CD 11/25—ENR 11/13.

†S. C., Charleston—Pub. Wks. Officer, Charleston Navy Yard, electric shop expan. Spec. 10707. Extended date. CD 11/25—ENR 11/13.

Bids Asked December 18

★**Calif., Los Angeles**—Los Angeles County Housing Auth., 1031 S. Bway., 504 wood frame dwellings, Mednik St. between 1 St. and Floral Ave. Over $500,000. Former contract rescinded. Maravilla Architects, 1100 Wright & Callender Bldg., archts. CD 3/14—ENR 3/14, under CA.

†Wash., Seattle — City, County-City Bldg., frame fire station, built on piling, with ramp and float. $100,000. **DPW.** G. W. Stoddard, Orpheum Bldg., archt.

★**Wash., Seattle**—Seattle Housing Auth., Broadway Ave. and Yesler Way, 178 units, Yesler Terrace housing. $625,000. USHA. Extended date. Holmes, Bain, Aitken, Stoddard & Jacobsen, c/o owner, archts. CD 11/12.

Bids Asked December 19

La., Lafayette—Lafayette Housing Auth., 50 unit housing, administration bldg., Job office, Proj. La. 5-1 and 56 dwelling units, administration bldg., Proj. La. 5-2. $365,400. USHA. CD 9/25—ENR 10/2.

Bids Asked December 20

Ky., Somerset—Somerset Municipal Housing Comm., 34 unit housing, Proj. Ky. 5-1. Extended date. USHA. CD 11/11—ENR 11/13.

Bids Asked December 21

N. C., Asheville—Asheville Housing Auth., 82 unit housing, Proj. NC-7-1; 90 unit housing Proj. NC-7-2. Extended date. USHA. H. Gaines, Asheville, archt. CD 11/25—ENR 11/27.

N. C., Concord—Concord Housing Auth., 46 unit housing, Proj. NC 8-1, and 46 unit housing, proj. NC 8-2. USHA. Extended date. CD 11/11—ENR 11/13.

Bids Asked December 22

†Calif., Mare Island—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 2 helix houses, Naval Radio Station, Spec. 10570.

P. R., San Juan—Puerto Rico Housing Auth., San Juan, P. R., 200 housing units, Project P. R. 2-3, for USHA. CD 11/11—ENR 11/13.

Bids Asked December 26

†Md., Beltsville—Div. Purchase & Traffic, Dpt. Agriculture, The Mall, 12 to 14 Sts. S.W., Wash., D. C., 4½ story administration bldg., U. S. Horticultural Station.

Bids Asked December 30

†Colo., Denver—U. S. Eng., 1709 Jackson St., Omaha, Neb., one 250 man mess hall for flying cadets. Lowry Field.

Bids Asked January 6

Ala., Fairfield—Fairfield Housing Auth., Fairfield, 100 unit housing. $350,000. USHA. Extended date. E. B. Van Keuren, Farley Bldg., Birmingham, archt. CD 11/11—ENR 11/13.

Bids Asked January 7

†R. I., Quonset Point—Yards & Docks, Navy Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., dispensary addn., Naval Air Station, Spec. 10729. CD 11/25—ENR 11/27.

Bids Asked About March 1

★**†Mo., Clayton (St. Louis P. O.)**—St. Louis Co., c/o W. E. Miller, clk., Court House, 4 and 5 story, bsmnt., 42x196 ft. and 56x66 ft., brick, rein.-con. health center, boiler house addn., and tunnel, County Hospital, North and South Rd., Docket Mo. 23-139. $522,500. **DPW.** Wm. B. Ittner, Inc., 408 Bd. Educ. Bldg., 911 Locust St., St. Louis archts. and engrs. CD 11/10—ENR 11/13.

LOW BIDDERS

†Calif., Alameda—Pub. Wks. Officer, Administration Bldg., Naval Air Station, Alameda, Nov. 26, 3 story, 140x180 ft., rein.-con. storehouse exten., from K. E. Parker Co., 135 South Park, San Francisco, **$211,867.** CD 11/6—ENR 11/13.

Calif., Barstow—City of Los Angeles, Dpt. Water & Power, 207 S. Bway., Los Angeles, Nov. 25, group patrol bldgs., from R. H. Parr, 206 W. 112 St., Los Angeles. **$91,300.** Est. $68,500. CD 11/6—ENR 11/13.

†Calif., Stockton—Con. Q. M., Fort Mason, San Francisco, Nov. 26, mechanics school, Inv. W-7215-42-6, from R. McCarthy, 1363 14 Ave., San Francisco, **$366,880.** CD 11/18.

Calif., Upland—Upland Housing Auth., City Hall, Nov. 21, 50 unit Campus Plaza housing, 50 unit Los Olivos housing project, both in Upland, and 25 unit Vineyard Village housing in Guasti, from Wm. C. Crowell Co., 495 S. Bway., Pasadena. **$407,376.** CD 11/5—ENR 11/13.

PUBLIC BLDGS. (Low Bidders, Cont'd.)

†**Colo., Fort Lupton**—Farm Security Admin., 1025 14 St., Denver, Nov. 22, 168 family units, 4 and 5 room frame houses, water, sewer and electric light sys., streets, etc., from C. Ray Edmonds Constr. Co., 1841 E. Moreland St., Phoenix, Ariz. **$312,404.** Est. $300,000. CD 11/19.

★**Conn., New London**—U. S. Coast Guard Div., Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Nov. 27, 3 story, 46x180 ft., brick, steel infirmary, hospital, etc., from Tremaglio Bros., 1500 Highland Ave., Waterbury, **$276,900;** boathouse, causeway, etc., Jacobs Rock, from Mondelci & Benventi, Jerome Rd., **$277,000.** CD 11/7 and 11/14—ENR 11/20.

★†**N. J., Dover**—Pub. Bldgs. Admin., 7 and D Sts. S.W., Wash., D. C., Dec. 1, 300 defense housing units, S. Salem St., Project 28101X, from Daniel J. Cronin, Inc., 717 S. Orange Ave., Newark. **$1,081,333.** CD 11/25—ENR 11/27.

N. Y., Deer Park—State Dpt. Mental Hygiene, Albany, Nov. 26 Kitchen and Dining Bldg. 5, State Hospital, from Mutual Constr. Co., 7 E. 42 St., New York, **$163,350.** CD 11/6—ENR 11/13.

N. Y., Jackson Heights—Bd. Educ., 110 Livingston St., Brooklyn, Nov. 25, excav., piling, capping, storm drains, concrete fdn., for Wilbur Wright High School of Aviation Trades, North Beach, from Depot Constr. Corp., Carol St., Brooklyn. **$293,000.**

N. C., Durham—Bd. Educ., Durham, Nov. 24, general contract vocational school, from P. S. West Constr. Co., Statesville, **$212,500.** CD 11/11—ENR 11/13.

★†**Pa., Baden** — Beaver County Housing Auth., R. Bennett, chn., Court House, Beaver, Nov. 25, 250 defense housing units for USHA, Project 36056Z, from Sherry Richards Co., 201 Wells Ave., Chicago, Ill. **$997,773.** CD 11/11.

†**S. C., Beaufort**—Bd. Trustees School Dist. 1, Beaufort Co., Nov. 26, constructing Beaufort School and addn. to Robert Small School, Docket S.C. 38-106, from V. P. Loftis, Builders Bldg., Charlotte, N. C., **$176,529. DPW.** CD 11/24.

†**Va., Alexandria** — Alexandria Housing Auth., Nov. 25, 120 defense housing units, Project 44136, for USHA, from Brennan & Sloan, Inc., 101 Park Ave., New York, N. Y., Base Bid 2 **$439,770;** from Justin C. O'Brien Co., Inc., 734 Lexington Ave., New York, N. Y., Base Bid 1 **$474,900.** CD 11/17.

†**Wash., Port Orchard**—School Dist. 402, Kitsap Co., Nov. 26, school, from Dolph Jones, 2213 N. Proctor St., Tacoma, **$200,800. DPW.** CD 11/14—ENR 9/18.

CONTRACTS AWARDED

★†**Ala., Sheffield**—Defense Homes Corp., 811 Vermont Ave. N.W., Wash., D. C., one hundred sixty 1 story frame residences, to Rust Eng. Co., Martin Bldg., Birmingham, **$600,000,** cost-plus-fixed-fee-basis.

Ill., East St. Louis—Illinois Armory Bd, c/o J. B. McGlynn, secy., 120 N. Main St., brick, stone, concrete armory, State St., **WPA. $250,000.** State Div. Architecture & Eng., C. Herrick Hammond, superv. archt., Armory Office Bldg., Springfield, archts.

†**Ill., Savanna** — Con. Q.M., receiving and storage bldgs., Savanna Ordnance Depot, to Vigo M. Jensen & Co., Albert Lea, Minn. **$88,544.** Bids 11/15. CD 8/20—ENR 8/28.

★†**Md., Baltimore** — Rustless Iron & Steel Corp., 1000 Edison Hy., 1 and 2 story, brick, corrugated iron, steel mill addn., concrete fdns., to Cummins Constr. Corp., 803 Cathedral St. Est. **$500,000.** U. S. funds.

N. H., Portsmouth—POWER PLANT—New Hampshire Gas & Eleectric Co., 46 Congress St., 1 story, brick, steel, concreete power plant, separate contracts. Over **$40,000.** Jackson & Moreeland, 31 St. James Ave., Boston, Mass., engrs.

★**O., Fairfield**—U. S. Eng., Wright Field, Dayton maintenance and command bldg., Patterson Field, to James I. Barnes Constr. Co., Logansport, Ind. **$1,596,999.**

O., Shelby—Shelby Memorial Hospital, H. Sotzen, hospital board pres., Shelby, general contract 3 story Shelby Memorial Hospital addn., to W. Friebel & R. Hartman, Shelby **$150,000.** Awarded 11/22.

★**O., Toledo**—Toledo Metropolitan Housing Auth., 392 Nebraska Ave., A. G. Spieker, chn., Toledo, general contract heating, plumbing, electrical work, landscaping 195 unit Port Lawrence Homes housing, Project OHIO 6-5, to A. Bentley & Sons Co., 201 Belmont Ave. **$730,000.** USHA. Bids 11/5. CD 11/13—ENR 11/20, under LB.

★†**Pa., Geneva**—War Dpt., 20 St. and Constitution Ave. N. W., Wash., D. C., Keystone Ordnance TNT Plant, brick, heavy timber, corrugated metal bldgs., to Fraser-Brace Eng. Co., Inc., 10 E. 42 St., New York, Est. **$35,000,000.** CD 11/10—ENR 11/13.

★**Pa., Pennhurst (P. O. Spring City)**—General State Auth., 2 and Locust Sts., Harrisburg, general contract male and female ward bldgs., Pennhurst State School, to Henry E. Baton, Inc., 1713 Sansom St., Phila., **$621,600***heating,** ventilating, to J. F. Moleski, Kulpmont, **$78,780***plumbing,** drainage, to

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Scraper A	34	All-Cable	165 ft.	155 ft.
Scraper B	20	All-Cable	225 ft.	175 ft.
Scraper C	22	All-Cable	100 ft.	80 ft.
Scraper D	35	All-Cable	25 ft.	272 ft.
Scraper E	31	All-Cable	95 ft.	110 ft.

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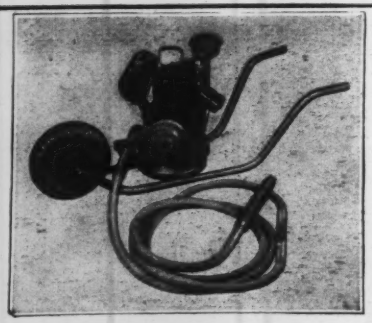

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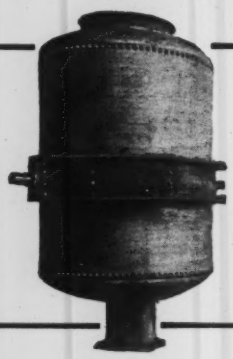

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PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

W. M. Anderson Co., 600 Schuylkill St., Phila., **$51,987*****electrical work, to W. V. Pangborne & Co., Inc., 1927 Montgomery Ave., Phila., **$37,644.** Grand total $790,011. Bids 10/24. CD 10/28—ENR 10/30, under LB.

★**†Pa., Phila.**—Con. Q. M., 20 and Johnston Sts., optical shop, Frankford Arsenal, to Hughes-Foulkrod Co., 809 Schaff Bldg., **$742,000.** Bids 11/14, awarded 11/18. CD 10/28—ENR 10/30.

★**†Tex., Houston**—Sheffield Steel Corp. of Texas, c/o Sheffield Steel Corp., Sheffield Sta., Kansas City, Mo., blast furnace and steel plant. Owner builds, **$22,670,855.** Defense Plant Corp. will finance.

†Wash., Seattle—Isaacson Iron Wks., 2917 E. Marginal Way, office bldg., laboratory, power house, gate house, fuel oil tanks, constructing footings and floors for 442x332 ft. forging, heat treating, machine shop and erection shipping bldg., 8531 E. Marginal Way, for Navy Dpt., Bureau Ships, to Henrik Valle Co., 407 3 Ave. W. **$183,000.** CD 6/30—ENR 7/3, under Industrial Bldgs.

Ont., Peterboro—Warime Housing Ltd., 55 York St., Toronot, 72 houses, Park Hill Rd., to Eastwood Constr. Co. Ltd., Dominion Bank Bldg., George St., about **$160,000.** CD 9/19—ENR 9/25.

N. S., Halifax—Dpt. National Defense for Sea, Ottawa, Ont., combined workshop, H. M. C. Dockyard, to Foundation Maritime, Ltd., 1538 Sherbrooke St. W., Montreal, Que., about **$300,000.**

Ont., London—Dominion Govt., Ottawa, barracks, Queen's Park Camp, day labor under supervision District Military Engineer. **$150,000.**

Que., Quebec City—Dominion Govt., Ottawa, Ont., munition plant addn., to A. Deslauriers & Son, Ltd., 68 Lallmont St. **$42,000.**

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Bellflower—C. L. Zastrow, c/o C. N. Aldrich, archt., 1834 Dawson Ave., Long Beach, completed plans 130 frame, stucco dwellings. $375,000.

Calif., San Francisco—Pacific Telephone & Telegraph Co., 140 New Montgomery St., plans being completed by H. A. Thomsen, Jr., 315 Montgomery St., 2 story, bsmnt., rein.-con., steel phone exchange addn. Over $150,000. Architect receiving bids until Dec. 1, for structural steel only.

Calif., San Francisco—Eleventh Church of Christ Scientist, c/o Bakewell & Weihe, archts., 251 Kearny St., church. $150,000.

Calif., San Leandro—Bates & Railey, Bank of America Bldg., Oakland, 1 story, wood frame homes. Total est. over $150,000.

Calif., San Pedro— B. Conner, c/o C. N. Aldrich, archt., 1834 Dawson Ave., Long Beach, completing plans 100 frame, stucco, brick dwellings. $350,000.

Conn., Bridgeport—Hebray Co., L. E. Amster, pres., Island Brook, 600 homes, 223 acre plot, Island Brook Acreage, North Bridgeport. Over $150,000.

Ill., Evanston — St. Athanasius Catholic Church, 1615 Lincoln St., plans by McCarthy, Smith & Eppig, 43 E. Ohio St., Chicago, school, Ashland Ave. $150,000, incl. equip.

Mass., Pittsfield—St. Joseph's Roman Catholic Parish, C. L. Foley, pastor, 414 North St., bids soon 2 story, bsmnt., brick, steel Conaty High School, Maplewood Ave. $250,000. J. R. Hampson, 30 Backman Ave., archt. CD 9/16—ENR 9/18.

Mass., Pittsfield—St. Mary's Roman Catholic Church. J. C. McMahon, pastor, bids soon, 1 story, bsmnt. brick, stone church, Tyler St. $200,000. J. R. Hampson, 30 Bachman Ave., archt. R. D. Kimball Co., 6 Beacon St., Boston, engr. CD 11/3—ENR 11/6, under CA.

Miss., Biloxi—J. S. Lau, Jr., Biloxi, 80 residences. $150,000.

★**N. J., Fords**—Home Club Builders, 189 Market St., Newark, plans by R. Evans, 140 Nassau St., New York, N. Y., 150 one and one and one half story, bsmnt., frame residences, West Pond Rd. $600,000.

★**N. J., New Brunswick**—St. Peters General Hospital, Easton Ave., plans by Epple & Kahrs, 15 Washington St., Newark, 5 story, bsmnt., brick, steel hospital addn., Easton Ave. $1,055,438. Applied for DPW funds. CD 8/20—ENR 8/28.

★**N. J., Paterson**—Barnert Memorial Hospital, 680 Broadway, plans by Kohn & Butler, 56 W. 45 St., New York, N. Y., 3 story, bsmnt., brick, steel hospital addn. $500,000. DPW funds sought.

N. J., Paterson—N. J. Bell Telephone Co., 540 Broad St., Newark, soon lets contract 2 story, bsmnt., 50x115 ft., brick, steel telephone bldg. addn., Paterson St. Voorhees, Walker, Foley & Smity, 101 Park Ave., New York, N. Y., archts.

N. J., Totawa—Bettie Mfg. Co., Main St., Little Falls, plans by T. Muller, 31 S. James Ave., Boston, Mass., sixty 1½ story, bsmnt. homes, near State Hy. 6. $240,000.

O., Columbus—Larcomb Constr. Co., 1174 W. Fifth St., 100 one story frame defense homes, James Rd. and East Broad St. $700,000.

★**O., Euclid (br. Cleveland)**—Hanson Building Co., c/o B. Lefton, pres., 260 E. 200 St., housing, incl. 300 unit brick tile, glass apartment, 18 single houses, community club house, roadways and sidewalks. Total est. $1,200,000.

O., Maple Heights (P. O. Bedford)—I. Gross, 3614 E. 151 St., Cleveland, 25 frame homes. $150,000.

★**O., Maple Heights (P. O. Bedford)**—Maple Building Co. and H. L. Ehlert, 847 Green ton Rd., Cleveland, 91 frame homes. $540,000.

O., Maple Heights (P. O. Bedford)—Zeman & Barish, 3674 E. 149 St., Cleveland, 46 frame houses. $276,000.

O., Youngstown—P. M. Wellman, Girard, 1,000 seating capacity theatre, Belmont and Alameda Aves. $150,000.

Okla., Britton—WKY Radiophone Corp., Skirvin Tower, Oklahoma City, final plans by Parr & Aderhold, Halls Bldg., Oklahoma City, 90x60 ft. building and 900 ft. steel tower for broadcasting station, near here. $150,000.

Pa., Franklin—F. E. Hedley, et al, Franklin, 30 or more dwellings. $150,000.

Pa., Nanticoke—St. Joseph's Slovak Church, Rev. J. M. Puskar, pastor, 741 S. Prospect St., brick, steel, concrete convent, E. Noble St. $150,000.

Pa., Pittsburgh—D. W. Hoggy, RD 1, Thomas Rd., Sharpsburg, fifty 1½ and 2 story, bsmnt., 25x30 ft. frame residences, Dorseyville Rd., Dorseyville, near here. $250,000. Bids Dec. 5, plumbing, heating, plastering, electrical work.

Ont., Ottawa—Bell Telephone Co. of Canada, 1050 Beaver Hall Hill, Montreal, Que., office and exchange exten., Albert St. $150,000.

BIDS ASKED

Bids Asked About December 2?

N. J., Elizabeth—Elizabeth General Hospital, 925 E. Jersey St., 5 story, bsmnt., brick, steel hospital and nurses' home addn., E. Jersey St. $300,000. A. A. Kaufmann, 259 N Broad St., archt. CD 2/4—ENR 2/6.

Bids Asked

Ill., Chicago—R. Gregori, archt., 30 N. La Salle St., remodeling 50 story hotel, 120 W Madison St., for Brevoort St., c/o 120 W Madison St. Corp. $150,000.

CONTRACTS AWARDED

★**Calif., Bellflower**—Defense Homes Corp., Amos and Andy Sts., 500 frame, stucco dwellings, Bellflower Blvd. and South St., day labor.

Conn., East Hartford (br. Hartford)—Arnold Constr. Co., Inc., 99 Simmons Rd., frame residences, Lawrence St. Owner builds **$150,000.**

Conn., Stamford—L. M. Strauss, 8 Mildred Parkway, New Rochelle, N. Y., residential project, Hunting Ridge Rd., to M. Terlizzo, 46 Ceretta St., Springdale. Est. over **$150,000.** CD 11/21—ENR 11/27.

Fla., Miami—Stewart Page Co., 1998 SW 22 Ave., 44 homes, Camner Gables First Addn. between S.W. 11 and 12 Sts. from Le Jeune Rd. to 44 Ave. Owner builds. Over **$150,000.**

N. Y., Dunkirk—Havens & Chapman, Olean, 25 frame dwellings, Newton Site. Owner builds. **$150,000.** CD 11/24—ENR 11/27.

O., Youngstown—Century Constr. Co., c/o A. Rousseau, archt., Mahoning Bank Bldg., 62 homes, S. Belle Vista Ave., to Atlas Eng Co., Mahoning and Schenley Sts. **$300,000.** Awarded 11/22.

Pa., Yorkshire (P. O. York)—T. Mills, 434 S. Duke St., York, 20 or 25 single frame dwellings, garages, etc., separate contracts. **$150,000.** CD 11/25—ENR 11/27.

Tenn., Nashville—Watkins Institute, 6 and Church, rebuilding Woolworth Store Bldg., to Foster & Creighton Co., American Bank Bldg. **$150,000.** CD 10/9—ENR 10/16.

Tenn., Nashville—F. W. Woolworth Co., Woolworth Bldg., New York, N. Y., store addns., alterations, to Foster-Creighton Co., Natl. Bank Bldg., **$150,000.**

★**Tex., Freeport** — Dow Magnesium Corp., Velasco, 200 one story frame type dwellings, in vicinity of here. Owner builds **$750,000.** CD 11/24—ENR 11/27.

★**Tex., Freeport**—New River Development Co., c/o F. A. Hunter, of Hunter Realty Co., 2808 Sunset Blvd., Houston, 208 dwellings, force account and sub-contracts. Approx. **$650,000.** CD 11/24—ENR 11/27.

Tex., Houston—River Oaks Corp., River Oaks Blvd., 1 story, rein.-con., steel, tile, stucco, community center bldg., appurtenances, to Wm. G. Farrington, 1719 Sunset Bldg., approx. **$150,000.** CD 10/2—ENR 10/9.

Tex., Midland—Midland Housing Co., Midland, 32 frame dwellings, concrete fdns., garages, utilities, etc., to A. & L. Housing & Lumber Co., J. C. Velvin, H. H. Hill, and D. J. Nix, and B. Linge Co., all of Midland, and Rockwell Bros. Lumber Co., Rusk Bldg., Houston, approx. **$150,000.** Est. $160,000. CD 11/17—ENR 11/20.

Wash., Spokane—B. Throop, N4807 Wall St., 60 houses, Montgomery and Bell Sts., day labor. **$250,000.** CD 11/10—ENR 11/13.

COMMERCIAL BLDGS. (Contracts Awarded, Cont'd.)

Wash., Spokane—J. L. Cooper, Radio Central Bldg., 94 houses, Walton, Garland, Upton and LaCrosse Sts., in Audubon Terrace, day labor. **$375,000.** CD 11/12—ENR 11/20.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., San Francisco—SHOP—Wood Working Shop, 274 Shotwell St., wood frame shop. $40,000.

Conn., Bridgeport—FREIGHT TERMINAL—J. and D. Eberson, archts., 2 W. 47 St., New York, N. Y., soon lets contract 1 story, 92x141 ft., brick, steel, concrete freight terminal, Connecticut Ave., for New England Transportation Co., 69 College St., New Haven. $40,000. CD 11/27—ENR 11/6.

Conn., Danbury—FACTORY—Danbury Rubber Co., Shelter Rock Rd., brick factory addn. $45,000.

Fla., Titusville—PLANT—Pinecastle Boat Co., W. C. Meloon, pres., Pinecastle, plans by Associated Architects, 6 West Church St., Orlando, plant. Over $40,000.

Ill., Argo—PLANT—Corn Products Refining Co., 333 N. Michigan Ave., Chicago, plans by Schmidt, Garden & Erickson, 104 S. Michigan Ave., Chicago, bids soon 1 story, 150 x 200 ft. plant addn. $100,000.

Ill., Chicago—GARAGE, etc.—Yellow Cab Co., 57 E. 21 St., plans by R. B. Kurzon, 134 N. LaSalle St., 1 and 2 story, 160 x 250 ft. garage and office bldg., 18 St. and Indiana Ave. $450,000.

★**Ill., Dixon** — PLANT — Illinois Northern Utilities Co., Dixon, power plant. $6,000,000. Sargent & Lundy, 140 S. Dearborn St., Chicago, engrs. CD 11/5—ENR 11/13.

Ind., Fort Wayne—PLANT—Fort Wayne Tool Die & Eng. Co., W. A. Mayer, mgr., E. Columbia St., plant addn. $110,000 with equip.

Md., Baltimore — FACTORY — Owner, c/o L. R. White, Jr., 10 W. Chase St., 2 story, 40x80 ft., brick factory addn., eastern sect. $45,000. L. R. White, Jr., 10 W. Chase St., archt.

Mich., Montague—POWER PLANT—Michigan Pub. Serv. Co., 148 E. Front St., Traverse City, 2,000 hp. 30x86 ft., steel, brick Diesel power plant, U.S. 31, north of city limits. $200,000.

Mich., Detroit—FACTORY—Diesel Engine Div. General Motors Co., General Motors Bldg., 1 story, brick, steel, rein.-con. factory addn., plain fdn. Approx. $100,000. Argonaut Realty Co., General Motors Research Bldg., engrs.

Miss., Brookhaven—MILL—J. M. Roberts Lumber Co., Brookhaven, rebuilding mill. $40,000 incl. machinery, equip.

Mo., North Kansas City—PLANT—Standard Steel Wks., 16 and Howell Sts., plant addns. $80,000.

Mo., St. Louis—FACTORY—Gardner Pocket Book Mfg. Co., c/o P. Gardner, 1906 Pine St., soon lets contract 1 story, part bsmnt., 80x255 ft., brick factory and office bldg., Vandeventer Ave., north of Accomac St. Gray & Pauley, 3800 W. Pine Blvd., archts. CD 10/1—ENR 10/9.

N. J., Caldwell—OIL HOUSE, etc.—Curtis Wright Corp., Propeller Div., State Hy. 6, revised plans by Albert Kahn & Associates, archts. and engrs., 345 New Center Bldg., Detroit, Mich., 1 story, 50 x 140 ft., brick, steel, rein.-con. chip disposal and oil house. Bids July 8, rejected. Will readvertise. Over $40,000. CD 6/30—ENR 7/3.

N. J., East Rutherford—SUBSTATION—Pub. Serv. Electric & Gas Co., 80 Park Pl., Newark, soon lets contract altering, repairing brick electrical sub-station, Van Winkle St. Over $40,000.

N. J., Kearny (br. Arlington)—SHOP—Acme Tool & Machine Co., 576 Davis Ave., soon lets contract 1 story, 100 x 100 ft., concrete block, brick, steel machine shop addn. Over $40,000. R. B. Flatt, 50 Broad St., Bloomfield, archt.

N. J., New Brunswick—PLANT—Mack Mfg. Co., 97 Jersey St., soon lets contract 1 story, brick, steel tank transmission mfg. bldg., Jersey St. Over $40,000. Lockwood Greene, Inc., 10 Rockefeller Plaza, New York, N. Y., archts.

N. Y., Niagara Falls — PLANT — National Carbon Co., Inc., Hyde Park Blvd., soon lets contract 59x117 ft. and 45x113 ft. plant addn. $40,000.

Ore., Portland—PLANT—Arden Farms Co., 617 S. E. Main, rebuilding milk dehydrating and dairy products plant, destroyed by fire. $200,000.

Pa., Bessemer—TOWER BUILDING—Union R. R. Co., Frick Bldg., Pittsburgh, D. E. Woozley, ch. engr., bids soon 4 story, brick, steel, hollow tile tower bldg. $173,302.

Pa., Latrobe—FORGE SHOP—Prack & Prack, archts., 517 Martin Bldg., NS, Pittsburgh, soon lets general contract, electrical and structural steel fabrication for structural steel frame Forge Shop 2, covered wharf and craneway, and open craneway, for American Locomotive Co., C. Davies, Latrobe, in charge.

Pa., Pittsburgh—WAREHOUSE—Pittsburgh & Lake Erie R. R. Co., P. and L. E. Term. Bldg., N. W. M. McCallum, ch. engr., soon lets general contract 1 story, 200x400 ft., brick,

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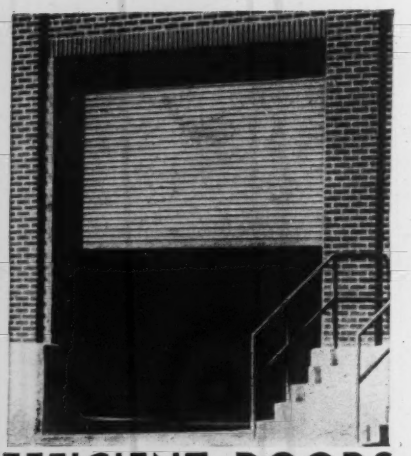

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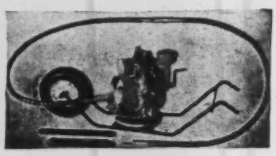

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INDUSTRIAL BLDGS. (Proposed Work, Cont'd.)

tile, steel warehouse. **$150,000.** C. F. Gaul, S. Smithfield and Carson Sts., owner's archt.

Tex., Mercedes—RECYCLING PLANT, etc.—Gulf States Oil Co., E. J. Coel, supt., Lower Valley Properties, Mercedes, imprv. recycling plant and pipelines, etc. $75,000.

Wash., Spokane — WAREHOUSE — Inland Truck & Diesel Co., 1229 First Ave., plans by A. W. Crowley, 1115 13 St., 1 story, 125 x 142 ft., brick, concrete warehouse, 3 and Pine Sts. $45,000.

Wis., Madison—WAREHOUSE, etc.—N & P Fixture Co., c/o J. J. and T. H. Flad, archts., 133 Langdon St., 1 story, 50x150 ft. concrete, steel, warehouse-office bldg. near here.

Wis., Merrill—WAREHOUSE—Page Milk Co., 1 story, 37x73 ft., concrete, hollow tile warehouse addn. D. Hougen, 132 E. Grand Ave., Wisconsin Rapids, archt.

★ **Que., Windsor Mills** — PLANT — Canada Paper Co. Ltd., 407 McGill St., Montreal, bids soon paper machine bldg. and altering plant, incl. pulp storage tank, altering pulp mill. About $500,000.

BIDS ASKED

Calif., Lynwood—FACTORY—Western Gear Wks. of Calif., B. Bannan, mgr., 11,183 Long Beach Blvd., (selected list bidders), 112x362 ft., rigid steel, rein.-con., steel factory, Imperial and Alameda Sts. $130,000. J. H. Davies, Ocean Center Bldg., Long Beach, structural engr. CD 11/12—ENR 11/20.

Conn., Bridgeport — FOUNDRY — Peerless Aluminum Castings Co., 55 Andover St., receiving bids on revised plans 1 story, 65x144 ft,. brick, steel, concrete foundry addn. $40,000. Former bids rejected. P. Petrofsky, 955 Main St., engr. CD 10/31—ENR 11/6.

Conn., Hamden—POWER PLANT—Acme Wire Co., 1255 Dixwell Ave., (invited list of bidders) 1 story, brick, steel, concrete power house, $60,000. Westcott & Mapes, Inc., 139 Orange St., New Haven, engr. CD 7/22—ENR 7/24.

★ **Ill., Chicago** — CARBON PLANT — Great Lakes Carbon Corp., 910 S. Michigan Ave., carbon plant, 18 acre tract, 114 St. and Torrence Ave. $500,000.

O., Cleveland—FACTORY—Bishop & Babcock Co., F. Mizer, pres., E. 53 and Lakeside Sts., brick, steel factory. $40,000. W. S. Ferguson Co., 2362 Euclid Ave., engrs.

LOW BIDDERS

N. J., Millington — FACTORY — Asbestos Limited, Inc., Division Ave., 1 and 2 story, 100x180 ft., brick, steel factory, Division Ave., from Schurman Constr. Corp., 782 Paterson Ave., East Rutherford, **$44,850.** S. V. Hopkins, 84 William St., New York, N. Y., engr.

CONTRACTS AWARDED

Calif., North Hollywood—FACTORY—Adel Precision Products Corp., 10777 Vanowen St., brick, concrete factory, 10737 Vanowen St. Owner builds. **$75,000.** Harnish Co., 3479 Union Pacific Bldg., Los Angeles, archts.

Calif., San Francisco—STORAGE—Kraft Cheese Co., 962 Battery St., 1 story, rein.-con. storage bldg to Cahill Bros., 206 Sansome St. **$49,000.** K. Theill, 580 Market St., engr. H. W. Martinson, 6714 N. Talman St., Chicago, Ill., archt.

Calif., San Jose—STORAGE—Anderson Barngrover Div. Food Machinery Corp., c/o Higgins & Root, archts., Security Bldg., 2 story, rein.-con. storage bldg., to W. M. Caldwell, 1241 Hedding St. **$47,872.**

Conn., West Hartford—FACTORY—Holo Krome Screw Corp., Brook St., Elmwood, 1 story, 45x130 ft., brick, steel, factory addn., Newington Rd., to R. G. Bent Co., 93 Edwards St., Hartford. Est. **$40,000.**

Ill., Forest Park—PLANT—Wilson & Co., 4100 S. Ashland Ave., Chicago, packing plant addn., 7413 Franklin St., to Enjay Constr. Co., 160 N. La Salle St., Chicago. **$40,000** incl. equip.

Ill., Lockport—PLANT, etc.—Texas Co., 332 S. Michigan Ave., Chicago, 2 story plant and office, to E. H. Swenson, Joliet. Est. **$100,000.**

Ill., Morton Grove—LABORATORY—Great Lakes Carbon Corp., 910 S. Michigan Ave., Chicago, laboratory, to City-Wide Builders, 3600 W. Grand Ave., Chicago. **$40,000** or more, incl. equip. Olsen & Urbain, 8 E. Huron St., Chicago, archts.

Md., Baltimore—PLANT—Rustless Iron & Steel Co., 1000 Edison Hy., steel frame, plant, concrete fdns., to Cummins Constr. Corp., 803 Cathedral St. Est. **$70,000.** O. B. Wight, 803 Cathedral St., archt.

Md., Baltimore—BOTTLING PLANT—Suburban Club Beverage Co., 1808 Paterson Park Ave., 1 story bottling plant addn., to Consolidated Eng. Co., 20 E. Franklin St. Est. **$40,000.**

Mass., Worcester—FACTORY—Mass. Steel Treating Corp., 118 Harding St., 1 story, 60x96 ft., brick, concrete factory, Brown and Grace Sts., to Worcester Stone Co., Inc., 21 Adams St. Est. **$40,000.** E. T. Chapin, 311 Main St., archt.

Mich., Detroit—FACTORY—Aluminum Co. of America, 3311 Dunn Rd., 1 story, brick, block and concrete, steel, factory addn., plain fdn., to A. R. Crow Co., 14341 Schaefer Rd. Est. **$40,000.**

Mich., Detroit—FACTORY—Cadillac Motor Car Co., 2860 Clark Ave., 1 story, brick, steel, concrete factory, plain fdn., incl. receiving and loading dock, to Albert A. Albrecht Co., 1204 Penobscot Bldg. Est. **$42,000.**

Mo., Springfield—PLANT—Spri[illegible]field Trail-er Co., H. F. Fellows, secy., remo[illegible]ng 58x12[illegible] ft., brick, steel plant, new equip[illegible]day labor **$40,000.** E. Hawkins, McDaniel B[illegible] archt.

N. H., Portsmouth—New Hamp[illegible]re Gas & Electric Co., 46 Congress St., 1 [illegible]ory, brick, steel, concrete power plant, separa[illegible] contracts. Over **$40,000.** Jackson & More[illegible]d, 31 St. James Ave., Boston, Mass., engrs.

N. J., Bayonne—FACTORY—W[illegible]tern Electric Co., 100 Central Ave., Kearn[illegible] altering, repairing brick factory, Avenue [illegible] to Hugh Montague & Son, Inc., 880 Bergen Ave., Jersey City. **$100,000.** C. T. Siebs, [illegible] Central Ave., Kearny, engr.

N. J., Belleville (br. Newark)—MANUFACTURING—American Tag Co., 113 Sussex Ave., Newark, altering, repairing 1 and [illegible] story, brick mfg. bldg., to Oscar A. Peterson Constr. Co., 78 N. Willow St., Montclair. **$45,000.** Maintenance Eng. Co., 59 Willet St., Bloomfield, archts. and engrs.

N. J., Bloomfield—PLANT—General Electric Co., 5 Lawrence St., 1 story, 53x114 ft. and 44x64 ft., brick, steel mfg. plant addn., to maintenance shop, engineering department and storage facilities, Lawrence St., to Becker Constr. Co., 361 Grove St., Newark. **$40,000.**

N. J., Clifton—STORAGE—Fritzsche Bros., Inc., 86-3 St., Clifton, 2 story, 60x175 ft. brick, steel oil storage bldg., 3 St., to John W. Ferguson Co., 152 Market St., Paterson. $75,000. Epple & Kahrs, 17 Washington St., Newark, archts.

N. J., Newark—FACTORY—J. A. Cozzone Co., 40 Kent St., 1 story, brick, steel mfg. bldg. addn. Kent St., to Schaedel & Bros. Co., Inc., 130 Bruce St. **$60,000.** W. A. Kinsey, 207 Market St., engr.

N. J., Ridgefield — FACTORY — Superior Marking Machine Co., 45 Lispenard St., New York, N. Y., 1 story, 80x105 ft., brick, steel factory, Grand Ave., to Interstate Constr. Co., 418 15 Ave., Paterson. Over **$40,000.** J. J. Closter, 303 W. 42 St., New York, N. Y., archt. CD 10/1—ENR 10/9.

N. Y., Brooklyn—GARAGE—Robins Dry Dock & Repair Co., 1-75 Beard St., 2 story, 80x217 ft. garage and locker room, to Citro Constr. Co., Inc., 356 Fulton St. Est. **$75,000.** CD 11/11—ENR 11/13.

N. Y., Buffalo—PLANT—Chevrolet Buffalo Div. General Motors Corp., 1001 E. Delavan Ave., Aviation Engine Plant 2, to John W. Cowper Co., 775 Main St. Est. **$50,000.**

Pa., Corry—SHOP, etc.—A. H. Nelson, engr., 209 Hays Bldg., Erie, 1 story, 50x200 ft. and 58x100 ft. plant addns., to Henry Shenk Co., 1115 Sassafras St., Erie, for Ajax Iron Works, Corry. Est. **$50,000.** CD 11/11—ENR 11/13.

Pa., Foster Brook (P. O. Bradford)—PLANT—Case Cutlery Co., Foster Brook, Bradford, 1 story, brick, concrete cutlery mfg. plant addn., to Benz Eng. Co., 29 Main St., Salamanca, N. Y. Est. **$40,000** with equip. T. H. Hendryx, 165 Interstate Parkway, Bradford, archt.

Pa., Foster Brook (Bradford P. O.)—PLANT—Kendall Refining Co., O. Koch, pres., N. Kendall Ave., Bradford, ethyl gasoline blending unit, loading platforms, pipeline to connect with main plant in Bradford, etc. Separate contracts. **$45,000.** CD 11/25—ENR 11/27.

Pa., Pittsburgh—BOILER HOUSE—Hubbard & Co., J. N. Hubbard, chn. Bd., 6301 Butler St., 1 story, brick, steel, concrete boiler house addn., 62 and Butler Sts., to Rust Eng. Co., Clark Bldg. Est. **$50,000.**

Tex., Sugar Land—MACHINE SHOP—Sugar Land Industries, Sugarland, machine shop, to I. Rambo, 5103 Sampson St., Houston, approx. **$42,000.** CD 11/7—ENR 11/13.

Wis., Wausau — WAREHOUSE — Wausau Constr. Co., 1 story, 60x90 ft., wings 30x30 ft. 18x20 ft., 20x20 ft., concrete block, stone warehouse, office bldg., to P. Wergin, 123 Grand Ave., Wausau. CD 11/5—ENR 11/13.

Wis., Wausau — WAREHOUSE — Wausau Serv. Co., 128 W. Washington St., general contract, 1 story, 60x100 ft. warehouse and shop bldgs., 40x40 ft. repair shop, to J. P. Doheny, 918 Kickbusch, Wausau; structural steel to Wausau Iron Wks., Wausau. CD 10/8—ENR 10/16.

Wis., West Allis—SHOP—Sterling Motor Truck Co., Inc., 2021 S. 54 St., 1 story, 100x102 ft., concrete, steel, brick shop addn., to Gebhard-Berghammer, Inc., 5420 W. State St., Milwaukee. U. F. Peacock, 3200 W. Wisconsin Ave., Milwaukee, archt.

B. C., Steveston—CANNERY—B. C. Pakers, Ltd., 7 Campbell Ave., Vancouver, brick on piling, cannery exten., to Hodgson-King & Marble, 1401 Main St., Vancouver. Est. **$40,000.** CD 11/3—ENR 11/6.

Man., Brandon—PLANT—Brandon Packers, Ltd., Brandon, meat packing plant addn., and boiler house, brick, concrete fdn., to F. Lissamann, 812 11 St. Est. **$45,000.**

Man., Winnipeg—PLANT—MacDonald Bros. Aircraft, Ltd., 50 Robinson St., Winnipeg, superstructure for engine test house, Stevenson Field, St. James, to Bird Constr. Co. Ltd., Confederation Life Bldg., **$116,000.** CD 10/17—ENR 10/23.

Que., St. Jean—FACTORY—Linerie Co-Operative de St. Jean, St. Jean, flax factory, day labor. **$40,000.**

Que., Shawinigan Falls—PLANT—Canadian Industries Ltd., C.I.L. House, 1135 Beaver Hall Mill, Montreal, 36x36 ft., steel, brick, concrete trichlorethylene plant exten., Summit St., to Fraser-Brace Eng. Co. Ltd., 107 Craig St. W., Montreal. About **$200,000.**

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Official notices of bids wanted on construction and related work, equipment and material for government, state, municipal departments and private enterprises

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Bids: December 16 (701)

Bridge

DEPARTMENT OF PUBLIC WORKS
STATE OF MARYLAND
STATE ROADS COMMISSION
FEDERAL AID PROJECT

SEALED PROPOSALS FOR Construction of bridge superstructure as follows:

WASHINGTON COUNTY, CONTRACT W-204-2-627—Maryland-Virginia Federal Aid Project No. E.R.H. 1-A (1): Construction of steel superstructure and concrete deck, railing, etc., for the bridge over the Potomac River connecting Washington County, Maryland, and Loudoun County, Virginia, at Sandy Hook, Maryland. The contract includes 2 steel I-beam spans @ 44'; 49'; 2 end steel deck truss spans @ 114'; 10 intermediate steel deck truss spans @ 190'.

The total length of bridge is 2230'±.

Preference Rating A-3 applied for.

The Employment Agency for furnishing labor on the above project is Maryland State Employment Service, 18 West Franklin Street, Hagerstown, Md.

The minimum hourly wage to be paid by the contractor on the above project shall be for "Skilled Labor", $0.70; "Intermediate Labor", $0.55; "Unskilled Labor", $0.40.

The attention of bidders is directed to the Special Provisions covering the subletting or assigning of contract and the use of materials. Will be received by the State Roads Commission at its offices, Federal Reserve Bank Building, Calvert and Lexington Sts., Baltimore, Maryland, until 3 P. M. on the 16th day of December, 1941, at which time and place they will be publicly opened and read. QUALIFICATION OF BIDDERS REQUIRED.

Bids must be made upon the blank proposal form which, with specifications and plans will be furnished by the Commission upon application and cash payment of $5.00, for each separate project, as hereafter no charges will be permitted.

No bids will be received unless accompanied by a certified check or bid bond payable to the State Roads Commission of Maryland, as required by Sec. 6, Chapter 761, Acts of 1939, of the amount as set forth in the proposal form.

The successful bidder will be required to give bond, and comply with the Acts of the General Assembly of Maryland, respecting contracts. NO REFUND WILL BE MADE FOR RETURN OF SPECIFICATIONS AND PLANS.

The Commission reserves the right to reject any and all bids.

BY ORDER of the State Roads Commission this 25th day of November, 1941.

EZRA B. WHITMAN, Chairman.
L. H. STEUART, Secretary.

Bids: December 19 (699)

State Highway Work

STATE OF NEW JERSEY
STATE HIGHWAY DEPARTMENT
TRENTON

NOTICE IS HEREBY GIVEN that sealed bids will be received by the State Highway Commissioner for:

ROUTE 28, SECTIONS 25B & 26A

Construction of Route 28, Sections 25B & 26A, Paving, North Branch Relocation, from Fidler's Elbow to Garretson Road, Somerset County. Length 2.3 miles. Estimated:

14,000 cu. yds. roadway excavation unclassified
58,000 cu. yds. borrow excavation
90,000 sq. yds. 10" rein. conc. pavement surface
13,000 sq. yds. bit. conc. pavement, Type A or T on penetration macadam foundation

Preference Rating A-4, Serial Designation 114-E, has been issued for this project by the Director of Priorities, Office of Production Management.

Bids for the above will be received at the office of the State Highway Department, Room 102, State House Annex, Trenton, N. J., on Friday, December 19, 1941, at twelve o'clock Noon, EASTERN STANDARD TIME, and will be opened and read immediately thereafter.

The receipt and opening of bids is subject to the proper qualification of the bidder in accordance with the provisions of the prequalification law and the regulations adopted by the State Highway Commissioner. Bidders must submit a revised financial statement and statement of plant and equipment with their bid.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file in the office of the State Highway Department, Trenton, New Jersey, and may be inspected by prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) for each set of plans upon application to A. Lee Grover, Chief Clerk, State Highway Department, Room 102 State House Annex, Trenton, N. J. Bids must be made on the standard proposal forms in the manner designated in the standard State Highway specifications and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten percent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal forms and special addressed envelopes will be furnished on application. Bids not enclosed in sealed special addressed envelopes will be considered informal and will not be opened. The right is reserved to reject any or all bids.

Signed: E. Donald Sterner
State Highway Commissioner

Bids: December 22 (697)

Water Main

CONTRACT 72
CONSTRUCTING THE
RESERVOIR 6—FERN STREET CROSS-CONNECTION LINE

SEALED PROPOSALS addressed to The Board of Contract and Supply of The Metropolitan District and endorsed "PROPOSAL FOR THE CONSTRUCTION OF THE RESERVOIR 6—FERN STREET CROSS-CONNECTION LINE IN THE TOWN OF WEST HARTFORD, CONNECTICUT", will be received at the Executive Office of The Metropolitan District at the Municipal Building, 550 Main Street, Hartford, Connecticut, until 2:15 o'clock P. M., Eastern Standard Time, Monday, December 22, 1941, at which time and place they will be publicly opened and read.

After the bids are opened and read they will be taken under advisement and the award of the contract, if awarded, will be made as soon thereafter as practicable.

The work to be done includes furnishing and installing material for about one (1) mile of pipe line starting at a branch in the present Reservoir 6—Reservoir 5 Pipe Line in Canal Road about 8,000 feet south of Albany Avenue and extending about 3,400 feet in an easterly direction in an easement across private property to Mountain Road and then about 1,600 feet in a southerly direction along Mountain Road to a branch in the present Fern Street Pipe Line at Fern Street.

Alternate proposals will be considered on the basis of 30-inch reinforced concrete cylinder pipe and 31½-inch electrically welded steel pipe, double dipped in asphalt enamel.

Plans and specifications may be obtained on and after December 8, 1941, at the Office of the Manager and Chief Engineer of The Water Bureau of The Metropolitan District, 1026 Main Street, Hartford, Connecticut, on deposit of five dollars ($5), in cash or certified or cashier's check, made payable to The Water Bureau of The Metropolitan District, which amount will be refunded if both are returned in good order within one month of date of opening of bids. No deposits will be refunded after that time. Specifications used in making a bid will be considered as returned.

Original scale blueprints may be obtained, if desired, at no charge.

Each proposal must be accompanied by a certified or cashier's check for an amount covering not less than ten per cent. (10%) of the total amount bid, made payable to The Metropolitan District, and a satisfactory surety bond, as stated in the Information for Bidders, for the total amount bid will be required of the successful bidder for the faithful performance of the contract.

The right is reserved to accept any bid, whether or not the lowest, or to reject any or all bids as the interest of the District may appear to require.

THE METROPOLITAN DISTRICT
BOARD OF CONTRACT AND SUPPLY,
By: Richard Dillon, Clerk.

Hartford, Connecticut,
November 25, 1941.

(Continued on page 164)

U. S. Government

U. S. ENGINEER OFFICE, Wilmington, N. C. Sealed bids, in duplicate, will be received until 12 o'clock Noon, December 30, 1941, and then publicly opened, for furnishing all labor and materials and performing all work for *dredging approximately 380,350 cubic yards of material* from Pamlico and Tar Rivers, N. C., between the highway bridge at Washington and a point in Tar River approximately 17¼ miles above the Atlantic Coast Line Railroad bridge at Washington, N. C. Further information upon application. (698)

U. S. ENGINEER OFFICE, HUNTINGTON, W. VA.—Sealed bids will be received here until 10:00 A.M. (E.S.T.), December 12, 1941, and then opened, for *furnishing and delivering approximately 101,000 barrels of Portland cement* for use in the construction of the Bluestone Dam near Hinton, W. Va. Further information on application. (703)

WAR DEPARTMENT: Office of the Constructing Quartermaster, Fort Leonard Wood, Missouri. Sealed bids, in triplicate, will be received until 1:00 P.M. CST, December 9th, 1941, and then publicly opened, for *constructing and completing approximately 17,600 feet of 6 inch water line, 53 fire hydrants*, all fittings, labor, equipment, materials, and appurtenances thereto, complete in place, *at Fort Leonard Wood, Missouri*. Plans and specifications may be obtained on deposit of certified check in the amount of Ten Dollars ($10.00) made payable to the Treasurer of the United States. (706)

(Continued on page 165)

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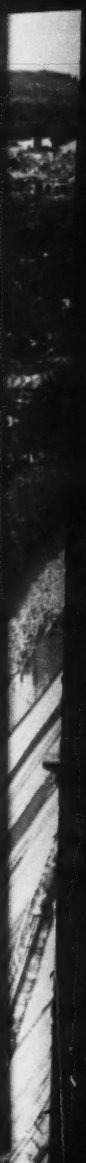
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